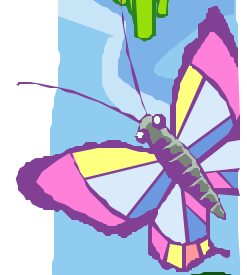


Kentucky's Wonderful
Commonwealth of Water

Intermediate Unit

Be a Water Historian



Kentucky's Wonderful Commonwealth of Water

Intermediate Unit



UNIT SUMMARY



While this unit helps students review watersheds and erosion, its main theme is how people have affected water in the Commonwealth throughout history and how all living things (including people) are connected with, and through, water. This connection is placed in the historical context of Kentucky's human populations.

In this unit students will learn the follow big ideas.

- ☛ Pollution causes problems for aquatic life and other life as well
- ☛ All life is connected
- ☛ Some human activities cause erosion, pollution and other changes in the water cycle and human activities can stop it as well
- ☛ Throughout Kentucky's history, humans have affected water and water organisms
- ☛ Water has always been very important to the people of Kentucky
- ☛ People in Kentucky, including prehistoric Indians, early settlers, older people who are still living today, and our own families have used water in very different ways throughout the years.
- ☛ Water was once a major form of transportation in Kentucky
- ☛ We control water much more today than we ever have before.

In the culminating activity of this unit, students create a time capsule using work completed during the unit. The capsule contains old photographs, oral histories and other sources of historical data, as well as projections for how people might use and protect water in the future.

Suggested open response question - For thousands of years, humans have been using and affecting water in the part of the world we now call Kentucky. Give an example of how people have affected water here and explain how this change has been both good and bad for life in Kentucky.

Portfolio suggestion – Ask students to pretend they are a person living in Kentucky at least 75 years ago or at least 50 years from now. (They may choose the time period and the kind of person they wish to play.) Have each student write a diary that would describe that person's life for a two-week period, including how he or she related to water on a day-to-day basis. Be sure students do research so what they describe is as accurate as possible. Publish excerpts from the diaries as a water history book to place in the time capsule.

Technology Extensions— Have students use desktop publishing software to “illustrate” their diaries. Introduce students to GIS by mapping your local watershed. Assign students different cultures or time periods and have them do a web search of how the people of that time and/or place used water.

Kentucky's Commonwealth of Water– Be a Water Detective Intermediate

Unit Essential Question: How has our relationship with water changed over time?

Standards

Social Studies

Social Studies SS-E-4.3.2, Students will understand that humans usually settle where there are adequate resources to meet their needs (e.g., areas with water, fertile land, protected land, different modes of transportation).

Social Studies SS-E-4.4.3, Students will understand that the physical environment both promotes and limits human activities (e.g., mountains as barriers or as protection, rivers used as boundaries or transportation routes)

Social Studies SS-E-5.5.3, Students will understand that the way we live has changed over time in both Kentucky and America because of changes in many areas (e.g., communications, innovations/inventions, homes, recreation, traditions, education)

Social Studies SS-E-5.1.1, Students will understand that the accounts of historical events are influenced by the perceptions of people and passing of time.

Social Studies SS-E-5.2.3, Students will understand that the way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, recreation, traditions, education).

Social Studies SS-E-4.1.5, Students will understand that different factors in one location can have an impact on another location (e.g., natural disasters, damming a river).

Social Studies SS-E-2.1.1, Students will understand that language, music, art, dress, food, stories, and folk tales help define culture and may be shared among various groups.

Social Studies SS-E-5.1.2, Students will understand that history can be understood by using a variety of primary and secondary sources and tools (e.g., artifacts, diaries, time lines).

Science

Science S-4-SI-3, Students will use evidence (e.g., descriptions) from simple scientific investigations and scientific knowledge to develop reasonable explanations.

Science SC-E-1.2.2, Students will understand that the position and motion of an object can be changed by pushing or pulling. The amount of change in the position or motion is related to the strength of the push or pull.

Science SC-E-2.3.1, Students will understand that the surface of the Earth changes. Some changes are due to slow processes such as erosion or weathering. Some changes are due to rapid processes such as landslides, volcanic eruptions, and earthquakes.

Science SC-E-3.3.3, Students will understand that all organisms, including humans cause changes in the environment where they live. Some of these changes are detrimental to the organism or to other organisms; other changes are beneficial (e.g., dams built by beavers benefit some aquatic organisms but are detrimental to others).

Kentucky's Commonwealth of Water– Be a Water Detective Intermediate

Writing

Writing WR-E-1.4, Students will write an informative and persuasive piece for an authentic audience to accomplish realistic purposes.

Arts and Humanities

Arts and Humanities AH-E-3.1.4, Students will create and perform using creative dramatics improvisation, mimicry, pantomime, role playing, and story telling.

Practical Living

Practical Living PL-E-3.3.2, Students will understand that to protect all citizens, there are community guidelines (e.g., water treatment, waste treatment, etc.) that promote healthy living environments in the community.



Unit Overview

Lesson Title and Description of Activities, Essential and Guiding Questions and Standards

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| # 1 | <p>The Runoff Water Mystery”- Students will learn about watersheds and the interrelationships between people living within a watershed by studying maps of their local watershed, building a watershed model and exploring a micro-watershed on school property.</p> <p>Standards: Science SC-E-3.3.3 and Social Studies SS-E-4.1.5</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • What is a watershed? • What are the physical characteristics of our local watershed? |
| # 2 | <p>“We All Live in a Watershed”-This activity involves students using an enviroscape model or the watershed and/or stream table models built earlier in this unit to explore how the actions of everybody in a watershed have a impact on other living things, including humans.</p> <p>Standards: Science SC-E-3.3.3 and Social Studies SS-E-4.1.5</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions</p> <ul style="list-style-type: none"> • How are the actions of humans within a watershed interrelated with other living things? |
| # 3 | <p>“ The Mysterious Drop in the Drainpipe”-This activity develops a better understanding of how drinking water gets into our homes, and where it goes once it leaves our homes. It also explains how this all fits into the water cycle.</p> <p>Standards: Practical Living PL-E-3.3.2 and Social Studies SS-E-5.2.3</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • How do we get water into our homes? • Where does wastewater go when it leaves our homes? |



Unit Overview	
Lesson Title and Description of Activities, Essential and Guiding Questions and Standards	
# 4	<p>“ Where Have All the Settlers Gone?”- Students will investigate early European settlements in their area to find out how close they were to bodies of water.</p> <p>Standards: Social Studies SS-E-4.3.2 and Social Studies SS-E-4.4.3</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • Where were the early settlements in our area of Kentucky located? • Were these settlements near rivers, streams or springs?
# 5	<p>“Heavy Water”- Students will carry water in buckets to simulate how early settlers had to carry nearly all the water they used.</p> <p>Standards: Social Studies SS-E-5.5.3</p> <p>Essential Question: How has our relationship with water changed over time ?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • How do we get drinking water into our homes? • Where does waste water go when it leaves our homes?
# 6	<p>“ Adapted, with permission, from “Water Crossings” in Project WET” - Students participate in a water crossing contest in which they must move their possessions (represented by a hard boiled egg) across a span of water (a cake pan).</p> <p>Standards: Social Studies SS-E-4.4.3 and Science S-4-SI-3</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • How did pioneers travel long distances and /or move goods? • What types of water transportation did early settlers use in Kentucky?
# 7	<p>“ Of Time and the River”- In this activity students will read a diary account from a young river worker in 1806, then compare river travel today to river travel 200 years ago.</p> <p>Standards: Social Studies SS-E-5.1.1 and Social Studies SS-E-5.2.3</p> <p>Essential Questions: How has our relationship with water changed over time?</p> <p>Guiding Question:</p> <ul style="list-style-type: none"> • How has Kentucky’s water travel changed in the past 300 years?

Unit Overview

Lesson Title and Description of Activities, Essential and Guiding Questions and Standards

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| # 8 | <p>“Water Craft”-In this activity, students will investigate different crafts used in early water transportation in Kentucky, then construct models of these vessels.</p> <p>Standards: Social Studies SS-E-5.2.3 and Science SC-E-3.3.3</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • How did pioneers travel long distances and/or move goods? • What types of water transportation did early settlers use in Kentucky? |
| # 9 | <p>“The Ohio River Mussel Mystery”- In this activity, students will learn about the importance of the mussel industry in Kentucky’s history, as well as the invasion of the zebra mussel.</p> <p>Standards: Social Studies SS-E-5.2.3 , SS-E-4.1.5 and Science SC-E-3.3.3</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • How have people used Kentucky’s resources in the past? • How do organisms change Kentucky’s environment? |
| # 10 | <p>“ The Mystery Surrounding Kentucky’s Dams”- This activity involves students conducting research to find out about the history of a nearby dam and how it changed life in the area.</p> <p>Standards: Social Studies SS-E-4.1.5</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Question:</p> <ul style="list-style-type: none"> • How are the actions of humans within a watershed interrelated with other living things? |
| #11 | <p>“ Capturing a Moment in Time: A Culminating Activity”- Using photographs, interviews, surveys, stories, etc. collected throughout this unit of study about water, students will create a time capsule to present to the local historical society, or school, to be kept safe for a specified number of years.</p> <p>Standards: Social Studies SS-E-5.1.2 and Writing WR-E-1.4</p> <p>Essential Question: How has our relationship with water changed over time?</p> <p>Guiding Questions:</p> <ul style="list-style-type: none"> • How has water been used in my community? • How can we preserve information for future generations to view? |

- What is source and nonpoint source pollution?
- How can people help prevent water pollution?

Unit Overview

Lesson Title and Description of Activities, Essential and Guiding Questions and Standards

12

“Investigating The History of Water Through Music”- After creating a timeline of historical events surrounding water in the local county and/or state, the music teacher will help students compile and perform a collection of songs and stories about the history of how water has been used (and abused).

Standards: Arts and Humanities AH-E-3.1.4 and Social Studies SS-E-2.1.1

Essential Question: How has our relationship with water changed over time?

Guiding Questions:

- What are some important historical water events in our area or state?
- Who can help us collect water songs?



Making The Unit More Inquiry-Based

Nearly all the activities in this unit are designed to help students ask questions and do some basic research on topics related to water quality in our state. However, a simple exercise woven throughout the unit can increase the numbers of questions asked by the students and make them your partners in finding answers to those questions. Here is how it works.

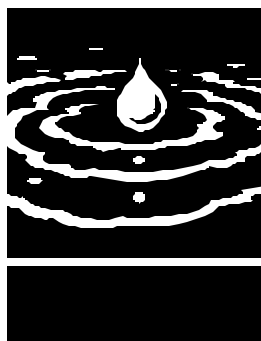
At the beginning of the unit, make (or have students make) about 100 wavy strips of colored paper long enough on which to write a question. (Strips should look like a stream or river) Also make (or have students make) about 100 drops of water on colored paper. These should be large enough on which to write an answer or fact. Also, designate a bulletin board or wall in the classroom as your “Water Discovery Area”. Place the paper in two boxes near the water discovery area. Label the two boxes, “question strips” and “answer drops”.

Encourage students to both ask questions in class and to write any questions they have on one of the question strips. They should then attach these to the water discovery area. Also tell students that each time they learn something new about water they are to write that new knowledge on an answer drop. (Students may need a little guidance at first.)

Throughout the unit pause occasionally to match question strips with answer drops. Explain to students that gaining knowledge is similar to the water cycle. It really never ends because each new question needs an answer and, very often, each new answer raises a new question. Also explain that, just as water changes forms, the answers to questions change as we gain new knowledge through science and inquiry.

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Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

The Runoff Water Mystery

Adapted from "Shedding Light on Watersheds", *Water Sourcebook, Grades 3-5*, EPA

Standards

Science SC-E-3.3.3, Students will understand that all organisms, including humans, cause changes in the environment where they live. Some of these changes are detrimental to the organism or to other organisms; other changes are beneficial (e.g., dams built by beavers benefit some aquatic organisms but are detrimental to others).

Social Studies: SS-E-4.1.5, Students will understand that different factors in one location can have an impact on another location (e.g., natural disasters, damming a river).

Activity Descrip-

Students will learn about watersheds and the interrelationships between people living within a watershed by studying maps of their local watershed, building a watershed model and exploring a micro-watershed on school property.

Materials

- Ingredients for salt dough (see activity sheet at end of lesson)
- 9 x 13 x 2 inch cake pan (for each watershed model)
- Hot plate, pan and food coloring (optional)
- Colored picture of a river (any will do)
- Laminated topography maps of local watershed (1 per student)
- Watershed transparency (picture included) and overhead projector
- 5-gallon buckets of water (for outside watershed demonstration)
- Art supplies and waterproof paint or clear shellac to seal the models
- Sprinkling can or spray bottle to create "rain" over models
- Enviroscope Model

Length of Lesson

30 – 60 minutes for at least 3 days

Vocabulary Words

Watershed—land area from which water drains to a particular water body.
Basin—a low lying area where surface water flows, such as a river basin.

Essential Question

How has our relationship with water changed over time?

Guiding Questions

- What is a watershed?
- What are the physical characteristics of our local watershed?

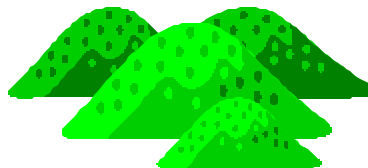
Skills Used

Analyze
Discuss
Infer

Observe
Identify
Write

Communicate
Collaborate
Apply

Describe
Interpret
Critique



Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

The Runoff Water Mystery, *continued*

Activity: Part 1

Step 1: Prior to this activity, gather materials needed to build a salt relief model of a watershed. (The recipe for salt dough and directions are included at the end of this activity.) Also, send a note home by students asking parents to send in an aluminum 9 x 13 x 2 inch cake pan or comparable container to use for their watershed model. Locate maps of the local watershed area. Obtain one per student. Make a transparency of the watershed shown at the end of this activity in the picture below the salt dough recipe.

NOTE: For state and local topography maps, contact the KY Geological Survey, the local water department, the state agricultural department, the local conservation district office or the department of geology at the nearest college or university. Aerial and topographic maps that can be downloaded may also be found at <http://terraservert.homeadvisor.msn.com/default.aspx>.

Step 2: Before students arrive at school, set out buckets of water by the parking lot (if it is paved and has storm drains installed that lead to a drainage area downhill on the property) and at least one other place on the school property where the lay of the land will allow for water to drain downhill. (This is done in preparation for students to learn more about how the local micro-watershed works. If it happens to be raining, just put on the rain gear and take students out to watch part of the water cycle in action!)

Step 3: At the beginning of class time tell students that they will be traveling outside on school property to see if they can help solve the mystery of where the runoff goes when it rains. Explain that before they can work on solving the mystery, they need some background training, so they need to listen carefully.

Step 4: Show students a colored picture of a river and the surrounding lands. Explain that the area immediately adjoining the river is called the **riparian area**. Ask students where the water came from to create the river. Write their responses on the board or chart. Explain that most of the water in our rivers comes from water that has drained off surrounding land.

Step 5: Ask students to think about how water flows downhill when it rains. Explain that the area of land that drains into a body of water is known as a watershed, and that watersheds come in all different sizes, ranging from a small hill on the playground, to a local creek, pond or lake, on to a nearby river, and even, on a much larger scope, to the Mississippi River Basin. (Explain that a river basin is the low lying area where surface water flows.)

Step 6: Show students a transparency or photocopy of the “Watersheds” picture found at the end

Dear Parents,

We are very excited about a project we are going to be doing at school this week. We will be building watershed models. Each student will need a 9 x 13 x 2 inch cake pan for this project. (An old pan will work great, or a disposable one will be fine.) If you have any small cans of enamel paint stored around the house that you do not plan to be using, we could use that, too (especially green and brown). I would like to thank you so much for the support you give to our school program!

Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

The Runoff Water Mystery, *continued*

of this activity. Ask students to talk about and discuss what they see in the picture. Point out that the picture shows two different watersheds, if students do not bring this up on their own. Use the picture to teach concepts of valley, hill, mountain, etc.

Also, teach the concept of the **crest** of the hill being the point where water flows downhill in all directions. (This will help when students are taken outside to look for a micro-watershed on the school property.)

Step 7: Give each student a copy of the local watershed map, or any map showing topography of your local area, including the school. Explain to students how to read a topographic map, if this is the first time one has been used. Instruct students to study the map closely and use their fingers to trace some of the paths water takes to get from different parts of the watershed area to the streams, rivers, ponds and lakes. Give students a few minutes to study the maps and discuss findings with neighbors. Circulate around the room and listen to discussions taking place. Ask students to share insights as you hear learning taking place within the small groups. Provide opportunities for writing question strips.

Step 8: If your local watershed, or topographic map, shows a prominent stream, ask students where they think the creek or river will eventually take the water collected from the local watershed area. Discuss. Also, reference the topographic map, if it shows the school property, and have students look for the highest elevations on the property.

Step 9: Tell students that they now have enough information to work toward solving the mystery of the runoff water.

Step 10: Take students outside. Explain that they are going to be looking for the crest of a hill and

watch water flow downhill. They will follow the water and watch to see what happens. Keep in mind that if it is a very dry time, the water will soak in the ground very quickly. (See the ground-water section in the Teacher Fact Sheets.)

Step 11: Give students time to explore the lay of the land in a specified area of the school property. Be there as a guide, if needed, to help them solve their mystery of trying to find the micro-watershed on the school property. Once they think they have located the crest of the hill in the watershed, confirm or reject their conclusion, and lead them toward a better understanding that it takes many small watersheds to feed into larger ones. This should also be a good time to talk about impervious surfaces (parking lots, sidewalks, etc.) and how they affect the watersheds through storm drains (as well as the pollutants that build up from leaking oil, salt, etc.)

Step 12: Collect student questions and post on bulletin board.

Assessment on Part 1

Once the students are settled back in the classroom after the adventure outside, review what they have learned about watersheds. Ask students to think and write about how a watershed and a river are interrelated. Ask students to include, as part of this assessment, a sketch of the immediate watershed that was located on the school property, showing how the water flows in the immediate micro-watershed.

Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

The Runoff Water Mystery, *continued*

Part 2

Step 1: Explain to students that they will get to make their own watershed model. Give students the option of trying to replicate part of their local watershed or the one pictured on the transparency. Explain that they will need to include hills and valleys so they will be able to see the direction runoff will take when it “rains” on their model. At this point, either gather the ingredients and cook the dough, or take out dough that has been prepared in advance. (Cooking the dough will take a while if done at school, unless you have several adult volunteers, pans and hot plates at your disposal. The dough can be made in advance and stored in airtight containers.) Follow instructions on salt dough recipe. You may ask parents to make the dough and send it in on the day you are doing the project. Have students paint models with water resistant paint when they are fully dry.

NOTE: Ask students for suggestions on how to get the liquid from the salt dough to evaporate faster, once the models have been shaped and are ready to dry. (Use this as an opportunity to review the evaporation stage of the water cycle!)

Step 2: Once the models are ready, they may be used for a variety of demonstrations, such as how water flows toward a water body, or how the unwise actions of one person who lives in a watershed affects everybody who lives down river. Refer to “Let’s Make a Watershed Model” in the Middle School Water Unit for further ideas.

NOTE: The watershed models can be used later in the “Mysterious Happenings in the Watershed” activity.



Step 3: While waiting on the watershed models to dry, the lesson can move forward in several directions, depending on the needs of the students. Some suggestions are listed below:

- Divide students into teams of four and give each team a map of the United States. Assign each team a particular area of the United States (New England, Southeast, etc.) and have them find and record the major rivers in that section of the country.
- Ask the teams to list states that are not part of the Mississippi River watershed.
- Instruct teams to find two rivers that do not empty into another river, but directly into the ocean. Explain to students that some rivers have very small watershed areas.
- Pass out world maps to each student group and have students trace and list a few rivers that flow into Africa’s Congo River. Explain that the Congo is a major watershed river in Africa. Ask students to trace and list some of the rivers that flow into South America’s Amazon River. Explain that the Amazon River is a major river for South America.

Extensions

1. Invite a geologist to class to explain how topographic maps are made. If possible, request they bring booklets that can be given to each student
2. Invite an expert from the fish and wildlife or conservation district office to talk about the local watershed.
3. Research information about the local watershed on the Internet. See Teacher Fact Sheets for a list of web sites to visit.
4. Borrow an Enviroscope table top model to help students understand exactly how water pollution occurs. See teacher fact sheets to find one near you.

Salt Dough Relief Watershed Model

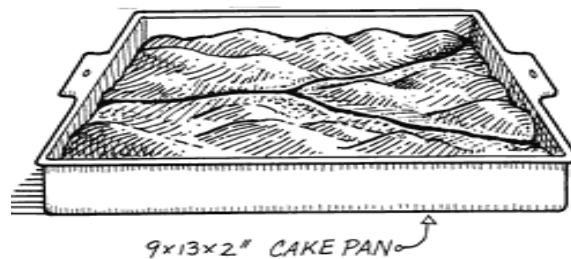
Salt Flour Dough (NOTE: This recipe makes between 1-1/2 and 2 cups of dough. The recipe should be doubled in order to make enough for the relief map. You might make it in 2 batches to ensure success.)

1 cup (250 mL) flour
½ (125 mL) salt
1 cup (250 mL) water
1 tablespoon (15mL) cooking oil
2 teaspoons (10mL) cream of tarter

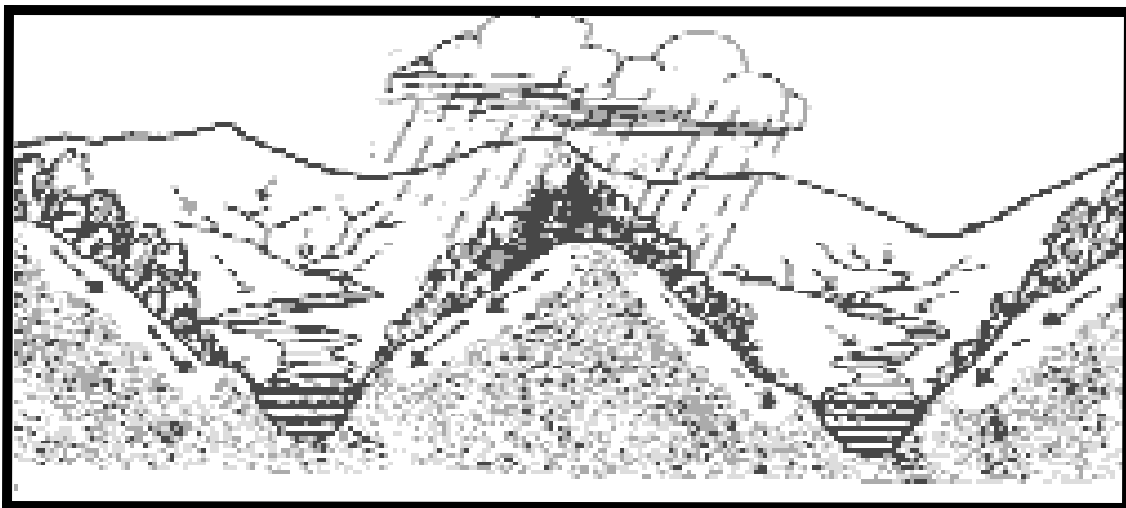
Mix and heat ingredients until a ball forms. Add a small amount of food coloring if desired. **NOTE: If the food coloring is added (half brown and half green) then the model will not have to be painted — just shellacked.**

To make model: Try to create a relief map similar to what is depicted on the teacher sheet. "Watersheds", or try to replicate the local watershed from one of the maps. On one end of the pan, let the two major valleys come together to form one larger one (like a "Y"). Make a "Riverbed" (depression) at the bottom of each major valley. Make sure that the end of the pan with the bottom of the "Y" is lower than the other end; i.e. the dough should be shallow at that end.

Allow the model to dry. Paint it with waterproof paint, or apply a coating of clear shellac. Using waterproof paint or shellac protects the model so that it can be reused.



Watershed Transparency (Enlarge)



Kentucky's Commonwealth of Water – Be a Water Historian

Intermediate

We All Live in a Watershed

Standards	<p>Science: SC-E-3.3.3, Students will understand that all organisms, including humans, cause changes in the environment where they live. Some of these changes are detrimental to the organism or to other organisms; other changes are beneficial (e.g., dams built by beavers benefit some aquatic organisms but are detrimental to others).</p> <p>Social Studies: SS-E-4.1.5, Students will understand that different factors in one location can have an impact on another location (e.g., natural disasters, damming a river).</p>			
Activity Description	This activity involves students using an Enviroscope model or the watershed and/or stream table models built earlier in this unit to explore how the actions of everybody in a watershed have an impact on other living things, including humans.			
Materials	<ul style="list-style-type: none"> • Enviroscope Groundwater Model (See Resources in Teacher Fact Sheets for schools and agencies who have models for loan.) • Watershed models built earlier in unit • Water and spray bottles • Variety of powdered substances to use for pollutants (See activity.) • Variety of materials to use to build dams, lagoons, levees, etc. 			
Length of Lesson	Two class periods, approximately 60 minutes each			
Vocabulary Words	<p>Best Management Practices (BMPs): effective ways to stop pollution.</p> <p>Effluent—the discharge of a pollutant in a liquid form, often from a pipe into a stream or river.</p> <p>Nonpoint source pollution: pollution that cannot be traced to a single point (e.g. outlet or pipe) because it comes from many individual sources or a widespread area (typically urban, rural, and agricultural runoff).</p> <p>Point Source Pollution: pollution that can be traced to a single point source such as a pipe or culvert (e.g., industrial, wastewater treatment plant, and certain storm water discharges).</p>			
Essential Question	How has our relationship with water changed over time?			
Guiding Questions	<ul style="list-style-type: none"> • How are the actions of humans within a watershed interrelated with other living things? • What is source and nonpoint source pollution? • How can people help prevent water pollution? 			
Skills Used	Research Discuss	Read Identify	Write Synthesize	Communicate Observe

Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

We all live in a watershed, *continued*

Activity – Part 1

Step 1: If possible, locate an Enviroscope Groundwater Model to use to demonstrate source and nonpoint source pollution in Part 1 of this activity. (See **Teacher Fact Sheets, Resources**, for a list of schools and agencies with models for loan and also for background information on water pollution.) Gather a variety of materials such as powdered drink mix (different colors), cocoa, coffee, soil, pancake syrup, etc. to simulate pollutants. If you are planning to use the watershed model built during an earlier activity, or a stream table, proceed to **Step 2**.

Step 2: Gather students around the model and sprinkle some green powdered drink mix on a field. Explain that a local homeowner has applied too much fertilizer in an attempt to make the grass greener. Ask a student to spray clean water on the “lawn” while others observe to see what happens as it “rains”. Explain the meaning of **source** and **nonpoint source pollution**. (Refer to vocabulary words.) Ask students which type of pollution the fertilizer represented (nonpoint source pollution). Encourage students to ask questions and record them on question strips.

Step 3: Ask students to brainstorm ways to try to decrease, or totally prevent the lawn fertilizer from polluting the closest body of water. (Possible student answers should include to decrease the amount of fertilizer used on the lawn or plant a buffer zone at the bottom of the hill.) Hand a sponge or porous shelf-liner to a student to place on the model. This will represent a buffer zone created by the roots of plants.

Step 4: Explain to students that as people become knowledgeable about the affects of pollution on other living things, they can also learn how to put **Best Management Practices (BMPs)** into place to help prevent water pollution..

Step 5: Continue to show the following examples of pollution taking place on the watershed model. After each type of pollution is shown, ask students to try to think of a **Best Management Practice (BMP)** that can be used to lessen or totally prevent the pollution from taking place. As students come up with ideas, hand them something with which to build their **BMP** (or pollution control) such as a piece of clay (for dams), sponges and bean sprouts (for roots of trees and plants), etc. Allow time for students to build their **BMPs** on the group model. If students have trouble coming up with ideas for **BMPs**, offer some of the following suggestions that might spur them to think in more divergent ways:

- Farm field (sprinkle soil on the model for erosion) – Build terraces of clay (parallel ridges) across the hill (not up and down).
- Cars and roads (squirt pancake syrup on model for oil) – Put sand or felt filter to catch oil.
- Bare spots on landscape (sprinkle cocoa or soil for erosion) – Cover with grass or trees (felt or sponges).
- Factory (sprinkle red powdered drink mix for effluent) – Build a little dam of clay to hold the effluent (waste disposal), pretend to treat it.
- Farm animals (sprinkle coffee for manure) – Build a lagoon (pond or pit) to hold manure.
- Anywhere – Pick up trash.
- Sink holes or illegal dumpsites (sprinkle yellow powdered drink mix to represent pollution) — Use sanitary landfills, that are lined to prevent seepage. Stop illegal dumping.

Assessment on Part 1

Ask students to reflect on and write about some of the things they have learned from observing and participating in this activity. Review the question strips and answer drops recorded so far.

Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

We All Live in a Watershed, *continued*

Activity - Part 2

Step 1: Begin this activity by mentioning to students that water is a wonderful substance that has many uses. Give students an opportunity to think about the many ways water can be used. List the different ideas on a chart, board or water drop.

Step 2: Tell students that over the years, people have had to build dams to help prevent floods and create hydropower; levees to help keep river basins from flooding so the land could be used for farming; channels for irrigation, locks and dams so boats could navigate up and down the rivers, etc.

Step 3: Explain to students that they will be constructing the different “barriers” that were mentioned in **Step 2** on the river in their model to observe what happens to the flowing water as a result of the manmade objects obstructing, or redirecting, the flow of the water.

Step 4: If each student has a model that was built earlier in this unit to use, pass out materials, such as modeling clay, salt dough, small gravel, tongue depressors, etc. to represent different manmade barriers. Ask students to use the materials to try to manipulate the flow of water in their models. Encourage students to work together in groups of 3 or 4 as teams, with each model in the group used for a specific type of construction or use the Enviroscape model as a class. Tell students to observe the results carefully, and, just like real detectives, keep very good notes on their observations, so they will be able to report their findings to the rest of the class. Encourage discussion among students during this activity. Have them fill out question strips and water droplets as new questions come up and new facts are learned.

Step 5: Once “obstructions” are in place, give students recycled water bottles filled with water to create the rivers in their models.

Step 6: Give students time to explore and experiment individually, or in small groups. As the activity appears to be concluding, ask students to stop what they are doing and discuss, as a large group, some of the discoveries, or insights that occurred during the experiment as well as questions they may have. List on a chart or board.

Step 7: Ask students to think about bodies of water in Kentucky that they have personally seen in passing, or vacationed near in the past few years. List those named. Ask students if they think those bodies of water originated “naturally” or are man-made bodies of water that resulted from a dam or other water flow technique being created by humans. Explain to students that they will be doing further detective work in another activity to find out more about the dams that have been built in Kentucky.

Step 8: Conclude this activity by asking students to take the notes they made while experimenting with the models and write a brief summary of what they observed happening to the streams when the flow of water was disturbed. Add this information to water drops.

Assessment on Part 2

Explain to students that there are many man-made water systems in Kentucky. Ask students to write down ideas as to why they think Kentucky has so many manmade water areas and what some of the changes were that had to take place in Kentucky as a result of dams being built.

Protecting Kentucky's Water – Be a Water Historian

Intermediate

The Mysterious Drop in the Drainpipe

Adapted from , “Excuse Me, Is This The Way To The Drainpipe?” , *The Water Sourcebooks*, EPA , pages D-7 to D-18

Standards

Practical Living: PL-E-3.3.2, Students will understand that to protect all citizens, there are community guidelines (e.g., water treatment, waste treatment, etc.) that promote healthy living environments in the community.

Social Studies: SS-E-5.2.3, Students will understand that the way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, recreation, traditions, education.)

Activity Description

This activity develops a better understanding of how drinking water gets into our homes, and where it goes once it leaves our homes. It also explains how this all fits into the water cycle.

Materials

- Student copies of the story, “Excuse Me, Is This the Way to the Drainpipe?” found at the end of this activity
- Student copies of the survey questions developed in class
- Note to parents explaining the homework interview (optional)

Length of Lesson

Approximately one hour, followed by a homework assignment

Vocabulary Words

Pesticide—a chemical substance used to kill or control pests such as weeds, insects, fungus, mites, algae, rodents, and other undesirable agents.

Septic tank—an on-site wastewater treatment system, generally for single families, not connected to the wastewater treatment plant.

Sewage—waste and wastewater from people and animals.

Wastewater treatment plant—a large facility that treats wastewater from homes and industry to a point that it can be safely discharged into the environment.

Essential Question

How has our relationship with water changed over time?

Guiding Questions

- How do we get drinking water into our homes?
- Where does wastewater go when it leaves our homes?

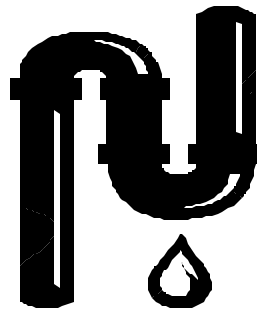
Skills Used

Research
Discuss

Read
Report

Write
Synthesize

Communicate
Interview



Protecting Kentucky's Water – Be a Water Historian Intermediate

The Mysterious Drop in the Drainpipe, *continued*

Activity: Part 1

Step 1: Distribute copies of the story, “Excuse Me, Is this the Way to the Drainpipe?” Have students read the story on their own, or in small groups.

Step 2: Discuss the story. Ask students if the water that is piped into their homes comes from a well by their home (like the little girl in the story). If students do not have a well at their home, ask if they know where the water comes from that is piped into their homes. If students are unsure about the source of their drinking water, ask them for suggestions on how they might find out more about the local water supply. (Recommend that students ask parents or contact the local water company for more information.) Record student questions and water droplet facts.

Step 3: Next, ask students where Martha Merriweather, the little girl in the story, lives — the city or the country. How do they know? Ask students if the waste water from their home goes to a septic tank in their yard, a wastewater treatment plant, or someplace else. Students may need to ask their families about this. (If plans are to graph this information, record the show of hands.) If living in a city, ask students where the water is cleaned to make sure it is safe enough to drink before being piped into homes, schools and businesses. Ask students where the dirty water travels to when it exits homes in the city.

Step 4: Call on several students to retell, in their own words, different parts of the route Willy

Wetsworth traveled in the story.

Step 5: As a culminating activity to Part 1, ask students to create a “Willy Wetsworth Travel Book” as they follow a drop of water through the hydrologic cycle, into their own home, and all the way down the drainpipe to wherever it goes to next. (Remind students to be specific as to the form the drop of water is traveling in at each stage of the trip — liquid, solid or gas.) Give students different options on how the book may be completed, including electronic text or powerpoint. Assign a deadline for completion, then give students time to quickly share their creations with other class mem-

Extensions/Variations

1. When discussing the story, collect information about source of water supplies at home, and whether students have a septic system, straight pipe, or send their waste water to a wastewater treatment plant. Graph the information using the computer and a graphing program. Display and discuss the graphs.
2. Invite someone who works for the local water or wastewater department or a plumbing contractor to be a guest speaker and explain how water comes into and leaves homes, schools and businesses.
3. Investigate where the school gets its drinking water, and where it goes when it leaves school.



Kentucky's Commonwealth Water – Be a Water Historian

The Mysterious Drop in the Drainpipe, *continued*

Activity: Part 2

Step 1: Once Part 1 of this activity has been completed, and students have a better understanding of where their water comes from and goes to, ask students how they think people got their water and disposed of sewage before there were systems in place to do this task. List different ideas.

Step 2: Explain to students that they will be interviewing someone in their family or community who is over 75 years old, or who has lived in a rural area without running water or sewers, to find out where they got their drinking water when they were younger, and how they disposed of the waste water from their home.

Step 3: Ask students to think of some questions they might ask during the interview to learn more about how water was used long ago. Make sure they include the following questions in the survey if they are not included in their own questions.

- Where did you get the water used in your home? How did it get into your house?
- Approximately how much water did you and your family use every day?
- How did you dispose of the waste water created by you and your family?
- What are some of the differences in how water was used when you were my age and how water is used now?

NOTE: Explain to students that if they do not have a family member who is over 75 years old to interview, then they need to ask their parents for help in finding someone in their neighborhood to interview in person or by phone or e-mail. Also, advise students that they may wish to take a tape recorder or video camera along to use during the interview so they record accurate answers. (If students choose to do this, remind them to ask the person they are interviewing for permission to tape or video prior to beginning the

interview.)

Step 4: As part of the assignment, ask students to write up a final report or powerpoint presentation comparing the use of water 60 – 70 years ago with how it is used now in their homes. Assign a deadline for completion of the project.

Assessment

Ask students to reflect on the interview and the comparisons they made between water usage 60 to 70 years ago and today in their written report. Then, ask students to write a short paragraph summarizing the most significant difference in water usage, or the most surprising thing they learned by completing this activity. Put these on water droplets

Dear Parents,

Each student has been asked to interview a family member, or somebody in the community, who is at least 75 years old to find out more about where they got water used in their homes as children, and how they disposed of the water once it was used.

Once the interview is completed, the students have been asked to write a paper comparing how water was used long ago with how it is used now.

As a class, we have compiled a list of questions to ask the person they choose to interview. The students have also been told they may wish to use a tape recorder or video camera to record the interview, if it is okay with the person they are interviewing.

This interview should prove to be a very exciting way for each student to gain a better understanding of what life was like in Kentucky before they were born.

Teacher BACKGROUND INFORMATION for “Excuse Me, Is This The Way to the Drainpipe?”

We seldom think about where the water we use in our homes or businesses comes from or where it goes once it disappears down the drain. The water we use everyday is very much a part of the earth’s water cycle and is continually recycled. When we use water we are, essentially, detouring it from its natural cycle and then, in short order, returning it back to the environment. Water can dissolve, suspend, and transport many substances. Therefore, the quality of the water we drink has a lot to do with where it has been and what has been in contact with it. For this reason, our water supply sources are not always drinkable and may need treatment to remove natural or manmade contaminants. All drinking water must meet federal and state standards that were put in place to ensure that the water is safe to drink. Needless to say, protecting our water from harmful contaminants to begin with, is important.

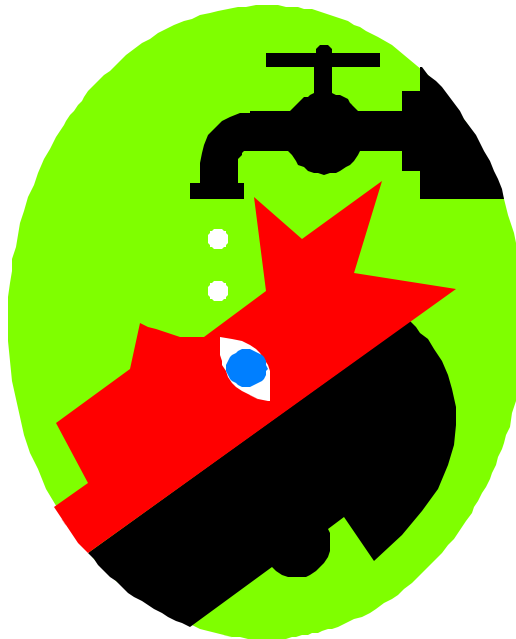
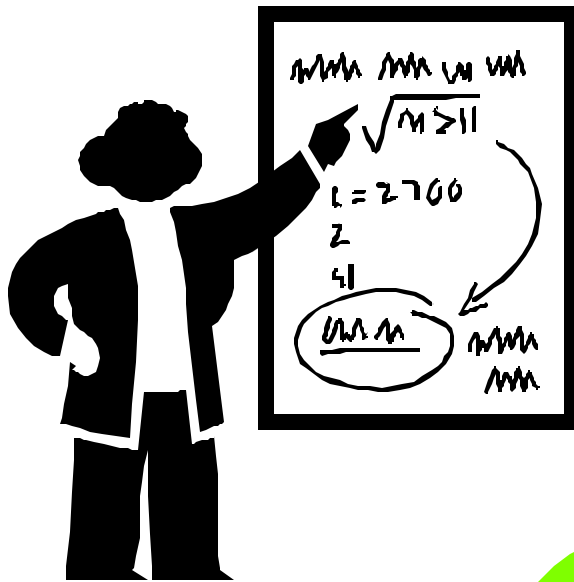
Our *drinking water* comes from either ground water (e.g., wells, springs) or surface water (e.g., rivers, lakes, manmade reservoirs). Ground water supplies are usually extracted by a pump, treated and disinfected when necessary, and delivered to homes and businesses through a network of pipes called a *distribution system*. Many people who live in rural areas have individual, on-site ground water wells with very simple piping systems; many other people who depend on ground water, but live in more populated areas, receive their water from large water supply wells with more complicated distribution systems.

Surface water supplies are withdrawn from rivers, lakes, and reservoirs through large intake structures. The water is disinfected and often treated at a *water treatment facility* to remove impurities before entering the distribution system. Surface water supplies often travel through many miles of underground pipes before reaching the faucets of people’s homes and businesses. Clean drinking water comes into our homes through one set of pipes and leaves our homes as *wastewater* through another set of pipes. The dirty wastewater that is flushed down the drain from our homes and businesses must be treated so that it can be safely and effectively recycled back to nature.

In rural areas, wastewater pipes are hooked up to small on-site sewage treatment and disposal systems, or *septic systems*, that are buried in the ground. In these systems, wastewater generally flows by gravity through a pipeline that runs from the home to a septic *tank*, where wastewater is partially treated before it flows onward to a *leaching system*. As wastewater passes through the leaching system (a buried network of pipes with holes through which the water passes) it is further filtered and treated by the soil and the microorganisms in the soil. Eventually, the treated water seeps into the ground water. In more populated areas, wastewater is conveyed from the home into a network of sewer lines which lead to a *wastewater treatment plant*. Here, waste-

water is cleaned by mechanical, biological, and chemical processes before it is discharged into ground water or surface water. Water that is discharged from wastewater treatment facilities must meet stringent federal and state standards.

Both septic systems and large wastewater treatment systems rely on small, *microscopic organisms* (e.g., bacteria) to help clean up water. These organisms, nature's own built-in water purifiers, devour and digest organic waste material in the wastewater. The more efficiently the organic solids are digested, the cleaner the water. This is a big reason why it is important not to flush harmful substances, such as household hazardous wastes, paints, paint thinners, and drain cleaners, down the drain. These substances can kill naturally-occurring bacteria, especially in septic systems, and cause the systems to function poorly.



Excuse Me, Is This The Way To The Drainpipe?

Martha Merriweather forgot to brush her teeth. She'd already said goodnight to her mom and dad, to Benji, her brother, and Lulu, her parakeet. She was all snug under her red polka dot blanket. In fact, she was pretty near asleep when she remembered about her teeth. It had been one of those days—one of those forgetting days. She forgot her lunch and had to borrow lunch money from Mrs. Johnson in the school office. She forgot her homework assignment and had to call her friend Terry to find out what it was. She'd even forgotten to feed Lulu until her mother reminded her. But Martha Merriweather did finally remember to brush her teeth. So she got out of bed, headed to the bathroom, turned on the light, picked up the toothbrush, picked up the toothpaste, put the toothpaste on the toothbrush. But, just as Martha was bringing the toothbrush with the toothpaste to her teeth, she noticed a drop of water that was just beginning to drip from the faucet—which isn't so very unusual. But this drop didn't drip and it didn't drop; instead, it seemed to get bigger...and bigger. Furthermore, it seemed to be waving to her. Yes, it was waving to her. In fact, it seemed to be speaking to her. Yes...yes, it was speaking to her. In fact, it was asking her a question.

"Excuse me, is this the way to the drainpipe?," the drop was asking as it pointed to the drain in the sink.

"Yes it is," answered Martha, her eyes wide open with amazement. "But...but....you're talking!"

"Yes," said the drop, "I often talk when I have a question, and, if you recall, I did have a question! You see," he said, "my travel book says that I should flow from the Merriweathers' ground water well, continue on up through the Merriweathers' water pipes, until I get to the Merriweathers' bathroom faucet. At that point, my travel book says, I should dive downward to the Merriweathers' drainpipe."

"Merriweather?," cried Martha, "Merriweather? That's my name—Martha Merriweather."

"And my name is Willy Wetsworth, a traveler and adventurer," said the drop. "Pleased to meet you."

"A traveler and adventurer?," whispered Martha gleefully.

"Yep," said Willy Wetsworth, "I spend my life traveling—in the clouds, in the sky, in the rivers, oceans, and streams, along the roadways, through the woodlands and grasslands, down in the soil, and between the rocks. Today, I'm traveling through water pipes—your water pipes. I was just pumped up into your house from the well in your backyard. It was a fun-foodling ride. Up, up, up, up, from the ground, then through this pipe and that pipe, until...well....here I am."

"Wow!," said Martha, trying to imagine what it would be like to travel in water pipes. She thought it might be "fun-foodling" if she were wearing a snorkel and flippers. She thought it might be like zooming through a water slide at the amusement park.

“Do you mean to say,” she asked, “that any time people brush their teeth, or wash their hands, or take a shower, or wash the dishes, or do the laundry, or flush the toilet, or water the flowers...that all that water has just had an exciting ride through the pipes?”

“Yep,” replied Willy.

“Do you mean to say that all the water that people use comes right from a well in their own backyard?,” asked Martha.

“Well...sometimes yes, and sometimes no,” replied Willy. “It says here in my travel book that some people, like the Merriweathers, live in the country where there are more trees than people, and where houses are spread apart. So when people who live in the country need water, they can usually get it from the water deep in the ground in their own backyard. But it’s different in the city—the city’s where there are more people than trees, and buildings are closer together. City water is usually piped in from a big well, or a lake, or a stream, or a reservoir that might be right near by or it might be many miles away. I have a friend who actually made the trip through city water pipes.”

“Really?,” asked Martha

“Yes,” said Willy, “he started out at a big reservoir. From there he went through a big pipe to a water treatment plant.”

“A water treatment plant?,” asked Martha. “What’s that?”

“According to my friend,” said Willy, “it’s a place where water is cleaned so it’s safe enough for people to drink.”

“You mean your friend isn’t safe to drink?” asked Martha.

“Well he probably is,” said the drop. “But, in our travels, we water drops never know what we’re gonna run into—or what’s going to run into us. Let’s face it, every living plant and animal on this earth needs us and uses us—people boil us, drink us, mix other stuff with us, throw their scumdiddle glunk in us. There are so many ways we can get dirty. Most days, mother nature can clean us up without anybody’s help. But sometimes mother nature can use some help and a water treatment plant does just that—it’s kind of like mother nature’s little helper. My friend said it was really weird going through the treatment plant, but he felt good as new by the time he got out of there. But then...,” continued the drop.

“But then what?,” asked Martha, who by now was trying to decide whether or not she would like it if *she* were a water drop.

“Then he took a wondrous, long, rip-snoodling ride through some great big pipes, and then some medium-sized pipes, and then some smallish pipes, right into an apartment house,” said Willy. “Other water drops went to other places like office buildings and stores and museums and libraries. And then...”

“And then what?,” gasped Martha, thinking that, indeed, it might be fun to be a water drop.

“Then,” said Willy Wetsworth, “the people who live and work in those buildings turned on their faucets and used their water for something or other—like brushing their teeth.”

“Oh,” said Martha, looking at the toothbrush and toothpaste she was still holding. “I was just about to

brush my teeth when I met you.”

“And I was just heading for the drain,” said Willy.

“But you mustn’t,” blurted Martha, who had already grown rather fond of the drop. “I mean...down the drain? What on earth will happen to you?”

“Well, it says right here in my travel book that I’ll wash down another set of pipes and end up in a septic tank that’s buried in the Merriweathers’ backyard.”

“A septic tank?,” exclaimed Martha. “I’ve heard of that. A man came to clean our septic tank a little while ago, and when I asked my mother what a septic tank was she told me that it was a big box that holds our dirty water after it goes down the drain. She said it helps make the water clean again. The dirty water stays in the septic tank for awhile and then goes into another pipe and then it goes into the ground.” Martha thought for a moment and then asked Willy, “Are you sure you really want to go down the drain to a septic tank? It sounds yucky!”

“It’s not so bad,” said Willy. “My travel book says the Merriweathers take good care of their septic system, so it does a good job of cleaning us up. My book also says the Merriweathers don’t throw all kinds of nasty scumdiddle glunk down the drain that might make my friends down in the septic tank sick.”

“You have friends in the septic tank?,” asked Martha.

“Yep,” said Willy. “heaps and gobs of eency, beency, plump, and jolly bacteria —mother nature’s little cleaner uppers. They live in the septic tank and love to eat the waste in your wastewater.”

“Ick,” thought Martha.

“They eat it and digest it and eat it and digest it,” said the drop, “and, like magic, they change it from *harmful* waste to *harmless* waste.”

“Wow!,” exclaimed Martha.

“But like I said,” said the drop, “my bacteria buddies get sick when people throw nasty scumdiddle glunk down the drain.”

“What kind of scumdiddle glunk?,” asked Martha.

“Oh, like paint thinner or plastics or oils or pesticides,” said the drop.

“Oh,” said Martha, who was beginning to think that being a water drop might not be as much fun as she thought. “I can’t say that I’ve ever thrown any glunk down my drain, and I know now—for certain—that I never will!”

“Hooray for you, Martha Merriweather!,” shouted the drop. “As you know, I thrive on adventure, but I’ve heard there are some septic systems that even I wouldn’t want to visit. Some people just don’t take care of them and, after awhile, they clog up and bog down and then my bacteria friends are anything but jolly. And then, of course...” said Willy, his smiling face giving way to a deep, dark frown.

“And then, of course what?,” asked Martha, almost afraid to hear the answer.

“Then, of course, we water drops stay dirty, dirty, dirty,” he answered with a shudder, “too dirty for anyone to drink...too dirty for brushing anyone’s teeth.”

“Oh,” sighed Martha.

“But I’m going down that drain Martha Merriweather,” Willy laughed and pointed to the drain. His face was once again lit up like the Fourth of July. “And if I get a little dirty and smelly in the septic tank, so what? Everybody gets dirty and smelly sometime. Down there in the septic tank, I’ll hang out with my friends for a while and then, like you said, I’ll float out of the tank and into a pipe—a pipe with holes in it,” he said. “It says right here in my travel book,” Willy began reading from his book, “You will float out of one of the holes in the pipe and sink down into a big gravelly place. From there, just relax and enjoy your journey into the soil below. Here in the soil you will find yourself getting cleaner and cleaner and cleaner and cleaner. In time, you will find yourself back in the ground water, not far from where your little adventure began.” Willy smiled a big, wide smile and closed his book. Martha asked Willy if his friend in the city had gone into a septic tank when he went down the drain.

“Oh no,” replied Willy. “There’s no room for septic systems in cities. Your septic tank is only a short trip from your house, but in the city, all the dirty water that goes down the drains of all the apartment houses and businesses travels through oodles upon oodles of pipes—smaller-sized, then middle-sized, then biggersized pipes that are buried under the streets. All that dirty water ends up at a flumongous, magrungous wastewater treatment plant.”

“Another treatment plant?,” asked Martha.

“Another treatment plant,” replied the drop, “but this one is called a wastewater treatment plant. A wastewater treatment plant is a place where dirty water that’s flushed down drains and toilets gets cleaned up so that it’s clean enough to go back into a nearby river, lake, stream, or ocean. Yep, my friend flowed into the wastewater treatment plant. He flowed from one big, flumongous tank to another getting cleaner and cleaner.”

“Were there heaps and gobs of eency, beency, plump, jolly bacteria to help him get clean?,” asked Martha.

“As a matter of fact, there were, Martha Merriweather, jillions and scillions and gadrillions of them. They were eating and digesting and eating and digesting...they ate so much,” laughed Willy, “that after awhile they just sank to the bottom of the tank and took a nap.”

“Took an nap?,” giggled Martha.

“Yep,” laughed the drop. “And, guess what they did next?”

“What?..What?,” cackled Martha. “What did they do next?”

“They woke up and started eating and digesting all over again,” roared the drop, swinging gleefully from the faucet. Martha was laughing gleefully too—she couldn’t help it—although she wasn’t sure which was funnier, the thought of jillions and scillions of plump and jolly bacteria having a giant feast or seeing a drop of water named Willy laughing himself silly.

“And what happened to your friend?” asked Martha, trying to calm her giggles down.

“Then,” said the drop, trying to calm his giggles down, “then he splashed out of the treatment plant and into the Witchywatchy River. That’s where I met him—in the Witchywatchy River. We spent one cold January as icicles on the bank of the Witchywatchy River.”

“Icicles?,” shivered Martha. “Weren’t you cold?”

“Nah,” answered the drop. “We’re water. Sometimes we float and flow as a liquid, sometimes we freeze into ice, and sometimes the heat makes us evaporate into the air as a vapor. It’s fun-foodling Martha Merriweather...fun-foodling. But now,” checking his waterproof watch, “I really must be moving on down the drain, and I think you must be brushing your teeth.” He noticed a big, wet tear well up in Martha’s eye and slide slowly down her face.

“Hey, hey, Martha Merriweather, I see a friend of mine sliding down your face—Tina Teardrop’s her name. When I see Tina Teardrop I know somebody’s sad. Are you sad?”

Martha felt her cheek for Tina Teardrop, but Tina had already evaporated into the air. “Must you go?,” she asked. “I could keep you with me in a special, special little jar...” But Martha knew that a jar would be a very bad place for a traveler and adventurer. “Will I ever see you again?,” asked Martha.

“Of course you will,” smiled Willy. “Whenever you turn on your faucet, or catch a snowflake in your hand, or see the frost on your windowpane, or watch the mist rise from your spaghetti water, or swim in a swimming pool, or watch a flower grow—I’ll be there. I’m always here, Martha Merriweather. But if I were to become too dirty, even you wouldn’t want to have me around. So make sure you let your friends and family know that we water drops need to stay clean—for the sake of all the people and animals and flowers and trees in the whole wide world. So, S.Y.L., Martha Merriweather.”

“S.Y.L.?,” puzzled Martha.

“See Ya Later,” laughed Willy. “See Ya Later, Martha Merriweather,” he waved and winked.

“S.Y.L., Willy Wetsworth,” whispered Martha.

And, before her very eyes—right before her eyes—Willy got smaller and smaller until he was simply and purely a drop at the faucet. But, he’d left something behind. And what do you think it was? He left his travel book with all the pictures of pipes and wells and ground water and ponds and lakes and oceans and glaciers and raindrops and snow flakes and... Martha picked up the little book and opened it to the first page. And what do you think she saw? She saw a little message. It said, “To my friend Martha Merriweather. From your friend, Willy Wetsworth.” That’s what it said.

As Martha brushed her teeth, she watched the foamy water wash down the drain, knowing that Willy was on his way to another adventure. She turned the water off, put her toothbrush away, and returned to bed. She crawled under her polka dot blanket, then she took the travel book and tucked it carefully under her pillow. It had been quite a night...a FUN-FOODLING NIGHT!

Kentucky's Commonwealth of Water – Be a Water Historian

Intermediate

Where Have All the Settlers Gone?

Standards	Social Studies: SS-E.4.3.2, Students will understand that humans usually settle where there are adequate resources to meet their needs (e.g., areas with water, fertile land, protected land, different modes of transportation). Social Studies: SS-E.4.4.3, Students will understand that the physical environment both promotes and limits human activities (e.g., mountains as barriers or as protection, rivers used as boundaries or transportation routes)			
Activity Descrip-	Students will investigate early European settlements in their area to find out how close they were to bodies of water.			
Materials	<ul style="list-style-type: none">• E-mail access to contact Kentucky Historical Society (http://www.kyhistory.org/Programs/Community_Services.htm) or http://www.rootswest.com/roots-l/USA/ky.html• Access to phone to contact local historical society.• Encyclopedias• Local county maps (one for every 4 students)			
Length of Lesson	Varies depending on how long the research takes			
Essential Question	How has our relationship with water changed over time?			
Guiding Questions	<ul style="list-style-type: none">• Where were early settlements in our area of Kentucky ?• Were these settlements near rivers, streams or springs?			
Skills Used	Research Discuss	Read Report	Write Synthesize	Communicate Interview



Kentucky's Commonwealth of Water – Be a Water Historian

Intermediate

Where Have All the Settlers Gone? *continued*

Activity

Step 1: Before starting this activity with students, visit the web sites listed in the “Materials” section on the previous page to familiarize yourself with, and bookmark, the different Internet resources available for student research.

Step 2: Read the book, *Three Days on a River in a Red Canoe*. Ask students to think about and investigate why early settlements were built on or near water bodies. (Water was necessary for life and transportation.)

Step 3: Tell students that in this activity they will be learning more about early European settlements in their area of Kentucky. Explain that they will be interviewing local historians to find out where the first settlements were located in their county, and how close these settlements were to bodies of water. Students should be thinking of questions they want to ask and writing them on question strips.

Step 4: If students are unable to obtain the information listed in **Step 3** from a local historical society in the county where your school is located, have students visit the suggested web sites to locate information about the earliest settlements in their county (http://www.kyhistory.org/Programs/Community_Services.htm or <http://www.rootsweb.com/roots-1/USA/ky.html>)

Step 5: If there is a local historical society, ask students to help come up with a list of interview questions to ask the historical society's contact person about an early European settlement in the area. Questions should include:

- Where was the earliest known European settlement in your county?
- Why did people settle in that area?
- Was it close to water?
- How was the water of importance to these early settlers?
- Where was the first settlement in Kentucky?

Step 6: Using local county maps, assign students to work in small groups to locate towns and cities in their county. Ask students to check to see if these towns and cities are near water? If they are not, how do they get their water?

NOTE: Direct students to contact local water companies to find out where local drinking water comes from and how it gets to people's homes.

Step 7: Conclude this activity by asking students to write a short article describing how early settlements in Kentucky compare to present areas of development. Instruct students to try to find at least three ways that early settlements were like larger settlements of today, and three ways they were different. Accept any logical comparisons as correct in this assessment activity.

Extensions

1. Build models of what an early Kentucky settlement might have looked like. Display in an area of the school where others may view.
2. Interview older people in the community to find out what life was like for them and their parents (from stories heard growing up) when they were children. Make a collection of stories about life long ago in Kentucky from information collected during these interviews.
3. Check with the Kentucky Historical Society about borrowing a “traveling museum” with artifacts from the local area. (502 564-1792)
4. Plan a field trip to the Kentucky History Museum in Frankfort and arrange to participate in a program on early settlements in Kentucky.

Kentucky's Commonwealth of Water—Be a Water Historian Intermediate

Heavy Water

Standard

SS-E-5.5.3: Students will understand that the way we live has changed over time in both Kentucky and America because of changes in many areas (e.g., communications, innovations/inventions, homes, recreation, traditions, education)

Activity Description

Students will carry water in buckets to simulate how early settlers had to carry nearly all the water they used.

Materials

Several one-gallon buckets, two 20 gallon trash cans, a source of water, a large outdoor area near the water source.

Length of Lesson

About one hour

Vocabulary Words

Conservation and consumption

Essential Question

How has our relationship to water changed over time?

Guiding Questions

- How do we get drinking water into our homes?
- Where does waste water go when it leaves our homes?

Skills Used

Predicting and estimating

Activity

Background: Ask students if any of them have ever been tent camping? If so, how did they get the water they needed? Ask whose responsibility it was to get water to the campsite. Where did they wash up, go to the bathroom, get drinking water while camping?



Kentucky's Commonwealth of Water—Be a Water Detective Intermediate

Heavy Water, continued

Background, cont.

Explain to students that in pioneer times, and even as late as the early part of the twentieth century, many people, especially in rural areas, did not have running water or indoor plumbing. In fact, in many parts of the world, people still do not have these luxuries. Also explain that in past times, and in many third world countries today, it was the job of the children to carry water to the house.

(Note: There is much data on the relationship of water and poverty on the Internet but much of it is disturbing and should be viewed with teacher discretion.)


Activity

Step 1. Have on hand five to ten one gallon buckets plus at least two twenty gallon trash cans in which to place the water. Make sure to check with the school's maintenance folks before doing this activity since you may need help draining the water at the end of the activity. Set up the trash cans at least 150 feet from the water source. (note: If using a natural water source, you might want to have it checked for bacteria before allowing students to handle it.)

Step 2. Tell children they are going to pretend that it is the year 1820 in Kentucky. As it was then, it will be their job to bring water to the household. Have each child carry at least one bucket from the water source to the trash cans and pour the water into the cans. If they are children with special needs or very small children, assign them a partner to help with this activity, explaining that pioneer families always worked together to get things done.

Step 3: Once everyone has had a chance to carry the water, have children spend a few minutes in quiet reflection thinking about how it might have been to carry water like this several times a day everyday in all sorts of weather. Students may want to write about these feelings.

Step 4: Provide students with the following chart.

One toilet flush	5 gallons
Brushing teeth with water running	2 gallons
Dishwasher (one cycle)	20 gallons
Washing dishes by hand (with water running)	30 gallons
One load of laundry	40 gallons
One shower	5 gallons
	per min use

Ask each of them to use this chart to estimate how much water their families use each day. When they have a number, asked them to think how many trips it would take them each day to carry enough water to serve the needs of their families. Have a class discussion about whether students think people used as much water before it came into their homes automatically? What are some ways they might have saved water?

Assessment

Have students create a mural showing the side view of a house from 1820 and the side view of a house from 2003. Make sure they show all the water sources and uses in each house.



Kentucky's Commonwealth of Water - Be a Water Historian Intermediate

Adapted, with permission, from “Water Crossings” in Project WET

Standards

SS-E-4.4.3: Students will understand that the physical environment both promotes and limits human activities.

S-4-SI-3: Students will use evidence (e.g., descriptions) from simple scientific investigations and scientific knowledge to develop reasonable explanations.

Activity Description

Students participate in a water crossing contest in which they must move their possessions (represented by a hard boiled egg) across a span of water (a deep pan).

Materials

Copies or overhead of The River West (included); Map of the U.S. or local map; state road maps; hard boiled eggs or tennis balls; student collected natural materials (such as leaves, twigs, reeds, bark, etc.); string or twine; water proof glue; large cake pan, bucket or dish pan.

Length of Lesson

Two, one hour class periods.

Essential Question

How has our relationship with water changed over time?

Guiding Ques-

- How did pioneers travel long distances and/or move goods?
- What types of water transportation did early settlers use in Kentucky?

Skills Used

Analyzing, applying and evaluating

Activity: Part One

Background: Ask students if they have ever taken long car trips? Did they cross rivers or streams? How did they know when they did so? Ask how pioneers might have crossed these same streams before bridges were built or there were ferries.



Kentucky's Commonwealth of Water— Be a Water Historian Intermediate

Water Crossings, continued

Background (cont.)

Have students read (or read to them) the excerpt from the book *The River West* by Frances Fuller (see the next page). The excerpt describes a crossing of the Yellowstone River by a group of trappers and traders in 1829.

Have a discussion about what factors students might take into consideration if they were doing this. (time of year, alternate routes, safety, building material, etc.)

Step 1. Have students study a map of the United States or their local region and identify several major cities located at river crossings. Why are river crossings often associated with towns? Help students list the positive and negative impacts of a crossing site on the development of a region.

Step 2: Using road maps, have students select a river or stream in Kentucky and count the number of bridges and/or ferries that cross it. Have students list what factors they think are likely to influence their number and location. Discuss this.

Step 3: Have students imagine what it would be like to get to a river and know you had to cross it on your own without a bridge or ferry. Have each student write a short fictional story about such an event. The stories should include how the river looks and what the character thinks as they approach the river, as well as how they finally get across.

Activity: Part 2

Step 1. Tell students they are about to experience some of the challenges pioneers faced when they arrived at a river by participating in a water crossing contest! The goal of the contest is for small groups of students to plan, design and construct a means of carrying a load across a body of water. The competition should encourage a variety of interesting approaches.

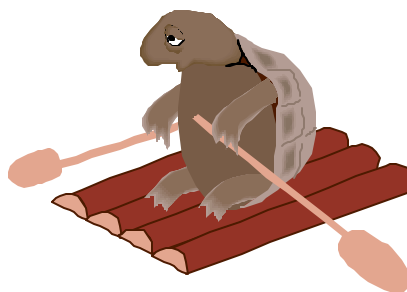
Step 2. Divide the class into small groups. Each group will build a water crossing conveyance from natural materials they gather in the outdoors. Since each group only gets one chance to succeed, encourage the group to discuss their ideas and options before beginning construction.

Step 3. Tell the students their load consists of a hardboiled egg (or tennis ball). Once each conveyance is complete, a hard boiled egg or tennis ball is placed on the conveyance and the whole thing floated on the water. It must support the load for two minutes without touching the sides or bottom of the container. If it does not capsize, fall apart or sink in two minutes, the group has succeeded in “crossing” the river.

Step 4. Have students vote on the most successful strategy and brainstorm improvements in raft designs for another contest. To make every group a winner, students may also vote on most aesthetic design, most innovative, best use of materials, etc.

Extensions

1. Give students maps of the United States or Kentucky. Have them plan a pioneer trail across the country or the state that minimizes water obstacles. Compare historical trails and the modern highway system. Have students list differences and similarities.



Kentucky's Commonwealth of Water—Be a Water Historian Intermediate

Water Crossing, continued

Arrived at the Yellowstone with his company, Smith found it necessary, on account of the high water, to construct Bull-boats for the crossing. These are made by stitching together buffalo hides, stretching them over light frames, and paying the seams with elk tallow and ashes. In these light wherries, the goods and people were ferried over, while the horses and mules were crossed by swimming.

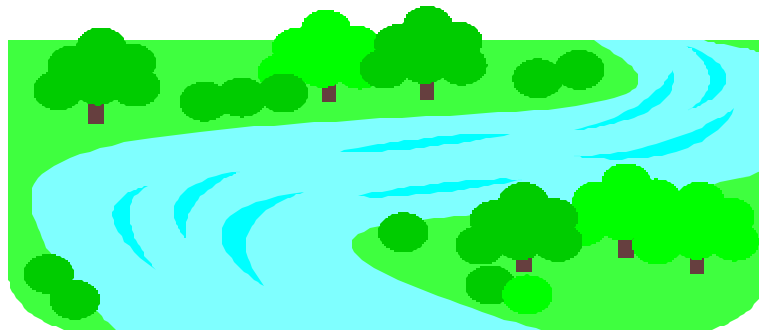
The mode usually adopted in crossing large rivers was to spread the lodges on the ground, throwing on them the light articles, saddles, etc. A rope was then run through the pin-holes around the edge of each, when it could be drawn up like a reticule. It was then filled with the heavier camp goods and, being tightly drawn up, formed a perfect ball. A rope being tied to it, it was launched on the water, the children of the camp on top and the women swimming after and clinging to it, while a man, who had the rope in his hand, swam ahead holding on to the horse's mane. In this way, dancing like a cork on the waves, the lodge was piloted across; the passengers as well as freight consigned, undamaged, to the opposite shore. A large camp of three hundred men and one hundred women and children were frequently thus crossed in one hour's time.

Excerpt from Frances Fuller Victor's book, The River West

Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

Of Time and the River

Standards	<p>Social Studies: SS-E-5.1.1, Students will understand that the accounts of historical events are influenced by the perceptions of people and passing of time.</p> <p>Social Studies: SS-E-5.2.3, Students will understand that the way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, recreation, traditions, education).</p> <p>The standard below is introduced in this activity</p> <p>Social Studies: SS-E-5.1.2, Students will understand that history can be understood by using a variety of primary and secondary sources and tools (e.g., artifacts, diaries, time lines)</p>			
Activity Description	In this activity, students will read a diary account from a young river worker in 1806, then compare river travel today to river travel 200 years ago.			
Materials	<ul style="list-style-type: none">• Student copies of diary entries found at the end of this activity• Internet access to locate modern navigational charts (optional) http://www.lrd-wc.usace.army.mil/navcharts.html• Map of the United States that students can use to find the route John Stuart's flatboat took to get from Madison County to New Orleans• Transparency of flatboat engraving at end of activity			
Length of Lesson	Approximately 60 minutes			
Essential Question	<ul style="list-style-type: none">• How has our relationship with water changed over time?			
Guiding Question	<ul style="list-style-type: none">• How has Kentucky's water travel changed in the past 300 years?			
Skills Used	Research Discuss	Read Visualize	Write Compare	Communicate Reflect



Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

Time Travel Detectives, *continued*

Activity

Step 1: Copy John Stuart's diary for each student. Visit the web site, <http://www.lrd-wc.usace.army.mil/navcharts.html>, and copy navigational charts that can be used by river captains today.

Step 2: Explain to students that they will be reading some diary entries written by a young Kentuckian who was not much older than they are now when he traveled down the Kentucky, Ohio and Mississippi Rivers on a flatboat in 1806. Instruct students to pay particular attention to the problems encountered on the trip, and how long it took the flatboat to travel from Madison County, Kentucky to St. Louis, Missouri. Tell students that they will be comparing the trip described in John Stuart's diary to modern day river travel.

Step 3: Show students a transparency of the engraving of a flatboat traveling down the Ohio River. (Copy found at end of this activity.)

Step 4: Pass out copies of the diary, and instruct students to spend about 10 – 15 minutes reading over the selection silently (or orally, if preferred). Have them record any questions they have on questions strips.

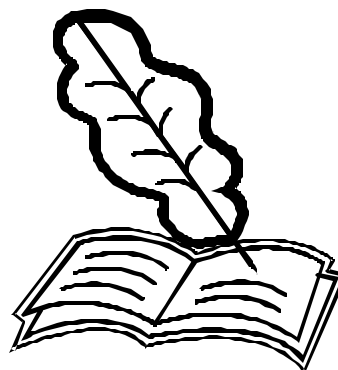
Step 5: Once the diary entries have been completed, ask students to discuss, and completely answer the following questions within a small group:

- According to the diary entries, what were some of the major problems encountered by the flatboat John Stuart worked on in 1806? Were these problems human or nature related? Explain?
- Could the problems encountered during John Stuart's trip be cause for alarm today with river boat captains?
- What resources are available today for river

boat captains to use that were not available 200 years ago?

- Students should list their own questions and water droplet facts.

Step 7: Give students maps of Kentucky with the river names on them. Read the diary entries out loud and have them follow John's progress along the rivers. Hold a class discussion about what students think it might have been like to be John during this time.



Extensions

1. Invite a river boat captain, or a local boater, to talk to students about problems navigating boats up and down rivers. Ask speakers to also include the pleasures of boating.
2. Read *A River Runs Wild*, by Lynn Cherry. Develop a timeline of the events portrayed in the book. Discuss the implications of the actions of humans.

Diary Entries from a Flatboat Worker in 1806

(To make money, frontier farmers could sell their produce in Kentucky or ship it to other cities. In February, 1806, young John Stuart got a job on a flatboat that was taking flour, tobacco, hemp, and whiskey to New Orleans. They started from Madison County on the Kentucky River, but did not get far because the river was too low. April showers finally made the river deeper and the journey began again. These entries from John Stuart's diary describe the trip up the Kentucky River and along the Ohio to the Mississippi.)

Wednesday, 16th (April). The rain I believe continued last night with but little intermission. I arose before daybreak and found the river had risen 10 feet. I had a good deal of difficulty to get our cable and stem fast for the water had risen considerably above them. By 10 o'clock it had risen 12 or 15 feet at which time we hove off. I shook hands with my acquaintances whose friendship had made me regret parting with them. I fired them a salute with my Pistol and we were soon out of sight. We were surrounded with drift wood, wild ducks, etc. We went rapidly — we compute our distance at nearly 40 miles. With much difficulty we landed about a mile below the Vineyard. The River still rises. Flying clouds and warm. I am now in a large Beech bottom which is all killed. This evening we saw 4 hogsheads of tobacco lodg'd on the River.

Thursday, 17th. Who that had been detained as I have been for 7 or 8 weeks by dry weather would have expected the contrary extreme to stop them; yet, this is literally the case. The river rose last night about 10 feet and has been rising rapidly ever since. It has now risen above 30. We judg'd it two high this morning to proceed. Accordingly, we are lying at a very good place about a mile below the Vineyard. Through the whole course of this day, large trees and timber of all kinds has been in a manner flying past; also, a cow, 3 or 4 canoes and this evening the wreck of a large new produce boat. We cannot tell who has lost her. This morning myself and one or two of our Boys went up to visit the Vineyards and to see the French there.

Friday, 18th. The river still continues to rise tho slowly this evening. We believe it has now risen above 50 feet perpendicularly. Vast quantities of driftwood has been passing us all day. I dropt our axe in cutting some bushes out of the way of the boat this morning into 15 or 20 feet of water. Went up to the Vineyard to borrow some tools to fix our boat; return'd them this evening and pass't some hours in conversing with an amiable Swiss girl. Weather clear and warm.

Saturday, 19th. This morning the River has ceased rising. I walk'd up to the Vineyard and spent some agreeable hours in the company of the amiable Maria Dunfore. Return'd in the evening to the Boat. The River has fallen today about 2 feet. We design to proceed down tomorrow morning. 4 flat boats and a keel has past us today.

Sunday, 20th. As in the rising of the River we had to keep watch, so last night on it fall we had to do likewise. The River fell about 4 feet last night & this morning early we put off; the river still high. We pass't the mouth of Hickman on our right and the mouth of Dick's River on our left. We pass't the 22 flat boats and 2 keels. We suppos'd we floated 45 or 50 miles and the sun was an hour and half high when we landed. We expect to reach Frankfort tomorrow. Berthond's Warehouse at shippingsport where G. Halley disposed of his Hemp to Berthond and Co. Flying clouds and windy. Lent G.H. 1/6.

Saturday, 26th. Went up to Louisville. Rec'd from G.H. 7/6. Bought a knife for 3/. Took a view of Louisville. A very handsome little Town. Two Gunboats building at the mouth of Beargrass creek which emptied in on the left side at the head of the Falls. Return'd and lay at the boat. Had company with us. Wind and clouds.

Sunday, 27th. High winds with rain last night. Went up through Louisville to the upper Landing and assisted T. Richardson to bring his House Boat over the Falls. Came very well without a Pilot. Windy weather. We bought some fine fish.

Monday, 28th. A number of boats have past the Falls. I repair'd our boat. Saw 6 boats put off together. Went on board the Western Traders, a handsome vessel lying at Anchor just below the Falls. She belongs to Berthond & Co. of 410 tons burthen. Some call her a ship, others only a square rigged brig. She is waiting for the River to rise to proceed down which must be 4 feet higher for her to go. It is now rising and has risen 2 or 3 feet since we have been here. Very windy weather. This evening I found a fresh Human jawbone on the beach.

Tuesday, 29th. About one o'clock P.M. we put off from the Falls, eight Flat Boats and a Keel in company. Left about 30 Boats at the Falls above and below. We lash't with the Ledgerwoods Keel and Mr. Joshua Baker's flat Boat. We proceeded on at the rate of between 3 and 4 miles an hour. An Island just below the Falls and 2 or 3 low rocky ones in it. This evening we divided into 4 watches of 3 hands, drew for precedence. I took the command of the first and sat until half an hour after 10 P.M.; about 9 we past the mouth of Salt River. Cool and windy. Banks of the river frequently low on each side. Growth Sugar tree Maple, Sycamore & Cottonwood; very good range here; about 70 miles below Louisville.

Wednesday, 30th. Had the 4th tour and just before daybreak 2 Indians came out to us. I bought a couple of fine Venison hams of them for 1/2 Gallon of whiskey. They could scarcely speak a word of English. Past the mouth of Blue River and an Island. This morning bought a catfish for 3 lbs. of tobacco weighing 40 or 45 lbs. Warm and pleasant; course of the River S.W.

Thursday, May 1st. We had a Thunder shower that brought us to for an hour or two. Past 2 or 3 Islands and the Yellow Banks about dark. Had the 3rd tour tonight. We think we float 80 miles in 24 hours. The Banks covered with cane. A number of wretched little huts scattered along on the river. Breckinridge & Ohio counties here, Henderson next & Livingston.

Friday, 2nd. We outfloat anything in company. Past a very Large Island this morning about 12 miles from the Red Banks. Past the Red Banks about 12. A small village there which is now in an improving state. Past the 2d Diamond Island about Dark—pretty large. I observed the marks of an hurricane on it. The right hand shoot the best, but our Boats took the left. 2d tour tonight. Mr. Ledgerwood parted with us about midnight and about 2 in the morning we past the mouth of the Wabash River an Island at its mouth. Flying clouds and pleasant weather.

Saturday, 3rd. Pass't the mouth of the Saline River about 10 this morning. The Banks covered with cane and cotton Wood. Past some very picturesque rocks today and this evening past the rock cave. Joshua Baker and self took our canoe and landed at it. We thought it worth looking at. An Island just above it—took the right hand shoot. Hurricane Island is said to be 6 miles below it. We made the left hand shoot with infinite difficulty and labour. We were to have only two watches tonight. I stood the 1st, but we landed about 12 or 1 at night on account of wind. Past an Island just before we landed. Flying clouds and warm.

Sunday, 4th. At daybreak, we putt off—several Boats that did not put to overtook us—15 boats in company. Past the mouth of Cumberland 12—an Island at its entrance—10 or 12 miles below past the Tennessee River—2 Islands at its mouth—8 or 10 miles below past Fort Massac just after dark. Flying clouds and very windy. Took the first watch, floated untill 11 and had to bring to on account of a Thunder cloud. Past 7 or 8 Islands today. Expect to reach the Mississippi tomorrow.

Monday, 5th. Put off about sunrise—several Boats past us while we lay to. Past Wilkersonville in the morning off which place 2 Cherokee Chiefs came on board us dressed in style. A large Barge from St. Louis came up to us on their way to the mouth of Cumberland. They informed us that there was a likelihood of a Spanish & Indian war; advised us to be on our guard. We Landed near night about half a mile about the mouth of Ohio. Mr. Joshua Baker and Foulger took our canoe and crossed the Mississippi and bought some sugar and salt. The Mississippi very low. Flying clouds and light breezes, but very hot.

Tuesday, 6th. Put off before light & row'd out into the Mississippi. Past 5 Islands—3 first on our left, 4th a very large one on right, 5th on left. Past a large Indian camp. Had to bring to at the Iron Banks for 2 hours on account of a storm. Landed in a bend with much difficulty and labour after dark. Cloudy, windy & a little rain. The river very low & falling—large sand bar.

Wednesday, 7th. Today we past Islands, 6 on right & 7—8 on left—had to bring to on account of wind about 12 where we staid till morning.

Thursday, 8th. Hung out an hook last night & this morning I caught a fine white cat fish about 30 lbs weight. Cloudy yesterday evening with a little rain & Thunder & last night we had a heavy fall of rain; expect the Mississippi will rise shortly. We put out this morning at the common time—5 Boats in Co.—2 Baker's, Spilman and Ramsay. An unlikely morning. Past New Madrid where J. Baker and self landed in a canoe and bought some necessaries—an handsome situation but said to be unhealthy. The wind continued to rise until 2 P.M. when it blew an hurricane. Drove Ja. Baker, Spilman, & us on a Bar in the River. Ja. Baker and Ramsay went farther down. We hung on the shoal about half an hour. The storm abated a little & We were off with the current—landed about half a mile below and found Ramsay's Boat sunk.



Kentucky's Commonwealth of Water – Be a Water Historian

Intermediate

Water Craft

Standards

Social Studies: SS-E-5.2.3, Students will understand that the way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, recreation, traditions, education).

Science : S-4-PS-3, Students will understand that the position and motion of an object can be described (e.g., measured, observed) by comparing it to another object or background.

The following standards are introduced.

Social Studies: SS-E-4.4.2, Students will understand that people adapt to or modify the environment (e.g., produce food, build shelter, make clothing) to meet their needs.

Social Studies: SS-E-4.4.3, Students will understand that the physical environment both promotes and limits human activities (e.g., mountains as barriers or as protection, rivers used as boundaries or transportation routes)

Activity Descrip-

In this activity, students will investigate different crafts used in early water transportation in Kentucky, then construct models of these vessels.

Materials

- E-mail access to contact Kentucky Historical Society (http://www.kyhistory.org/Programs/Community_Services.htm)
- Access to phone to contact local historical society.
- Encyclopedias
- Kentucky relief map without towns or roads, found at end of activity
- Pictures of early river vessels, found at end of activity
- Heavy aluminum foil, clay, toothpicks, craft sticks, etc., to use in construction of river vessels at school (optional)

Length of Lesson

Depends on how lesson is presented

Essential Question

How has our relationship with water changed over time?

Guiding Questions

- How did pioneers travel long distances and/or move goods?
- What types of water transportation did early settlers use in Kentucky?

Skills Used

Research, Read, Write, Communicate, Discuss, Report, Construct, Analyze



Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

Water Craft, *continued*

Activity (Thanks to the Portland Museum of Louisville for assistance with this activity)

Step 1: Prior to beginning this activity, make a transparency of the Kentucky map and the early river transportation pictures that are found at the end of this activity.

Step 2: Show students the map of Kentucky on an overhead projector. Ask students to imagine they are pioneers and think about how they would travel and move goods before there were roads. List ideas and questions.

Step 3: Explain that because of Kentucky's topography, there were many rivers, creeks and streams in Kentucky when the first settlers arrived. Ask students to think about the different types of water transportation people used to move themselves and their goods before there were roads and better forms of transportation (canoe, paddleboats, flat-boats, river packet boats, keelboat, steamboats, etc.). Show pictures of some of these early forms of water transportation.

Step 4: Tell students that they will be researching and constructing different types of water vessels used in Kentucky over the past 300 years. Give students different ideas of resources they might use to find more information that may help them: the Kentucky History Museum, the Kentucky Heritage Council, the local historical society, the Portland Museum in Louisville, encyclopedias, etc. Explain that they will need to write a short report about the vessel they decide to build, as well as build a model of the river vessel.

NOTE: This lesson may go in two different directions at this point. The construction of the boats may be assigned as a homework project, or simple materials such as clay, craft sticks, glue, toothpicks, heavy aluminum foil, straws, tape, etc. may be made available for students to use in the classroom, and the boats may be completed at school.

Step 5: Give students time to complete their research and boat construction, then set a day for students to share the mode of water transportation they chose and report on it to the rest of the class.

Step 6: Use a water table or tub filled with water to test the completed crafts to see if they will float. Once this has been checked, create turbulence by stirring the water to check them further. Finally, add cargo (pennies, paper clips, etc.) to see if the boats will continue to float. If the boats sink, ask students to think about what design flaw caused the boat to sink, and how it might be improved.

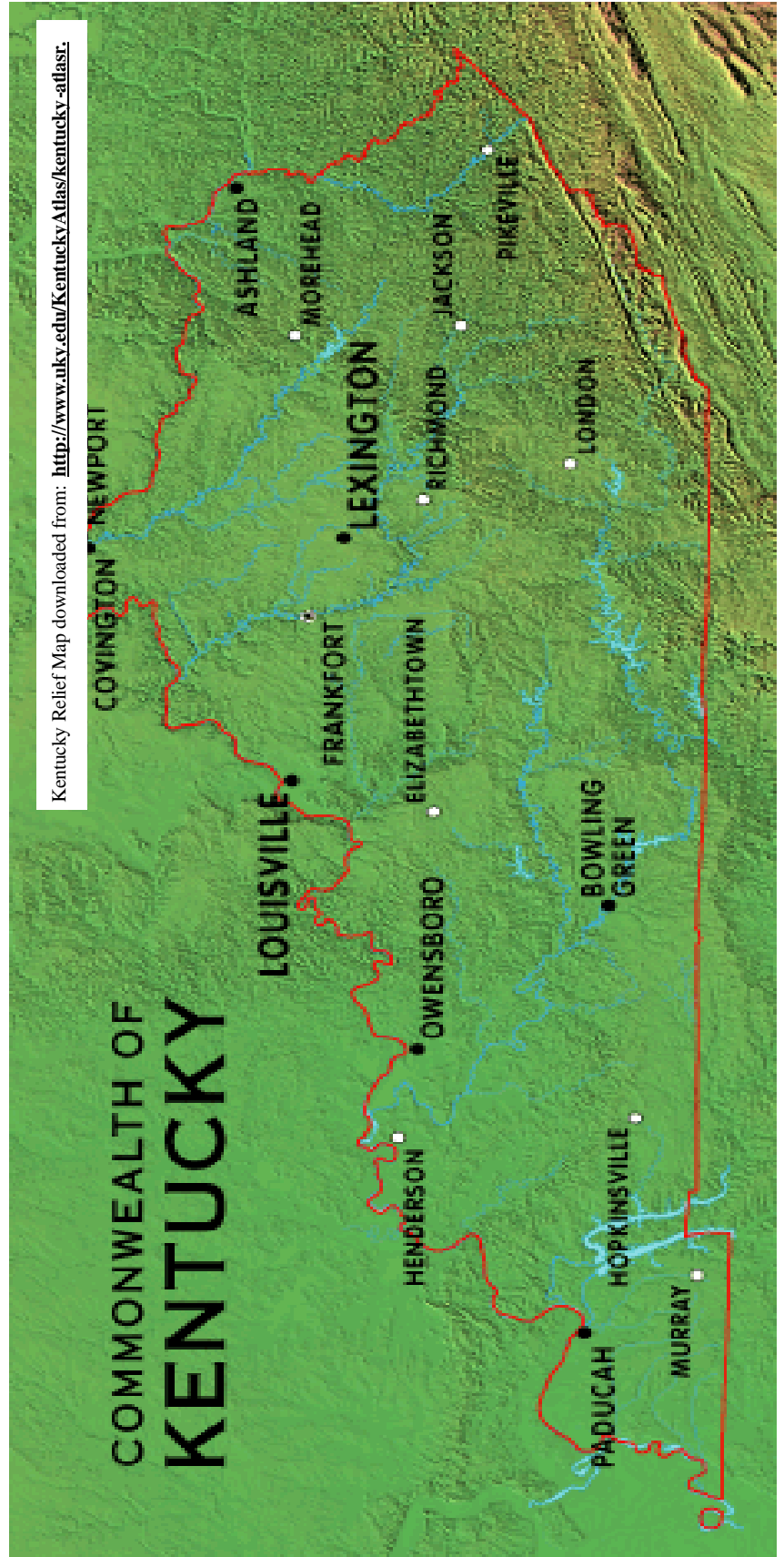
Step 7: Ask students to reflect on, and answer, this question: Why did people from different areas build different kinds of boats and why are handmade boats in less demand today than in the past?

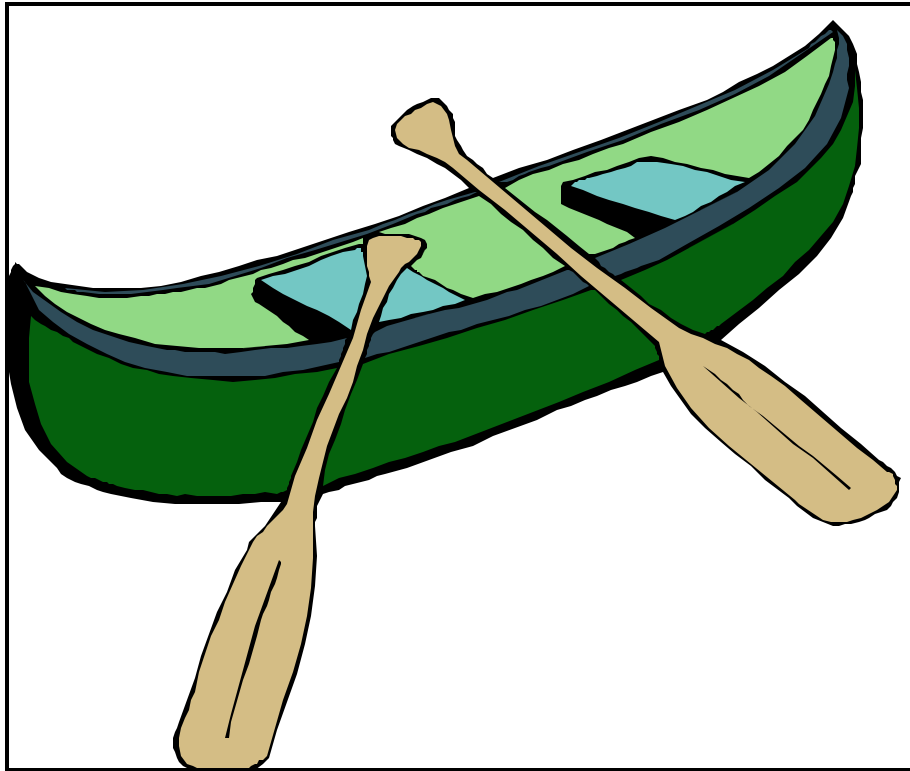
NOTE: Extra activities are included at the end of this lesson to use with students, if desired. The pictures, short stories, and follow-up questions were supplied by The Portland Museum, in Louisville, Kentucky. (See **Extensions** for more information about the museum.)

Extensions

1. Contact or visit the Louisville Portland Museum at 2308 Portland Avenue, Louisville, KY 40212, TELEPHONE: 502/776-7678, to learn more about the history of the Ohio River development over the past 400 years.
2. Display river vessels, along with written reports, in a prominent area in the school, or at the local historical society.
3. Compare early river vessels with present day vessels. How are they similar? How have they changed?
4. Brainstorm river occupations, then research to see how accurate the guesses were. Invite local commercial fishermen, a boat captain or dock workers to come to class to talk about their jobs.

Map of Kentucky Showing Major Rivers and Cities





canoe

Canoe

aluminum
canoe
cover
easily

metal
paddles
pitch
portage

river
tight
water
wooden

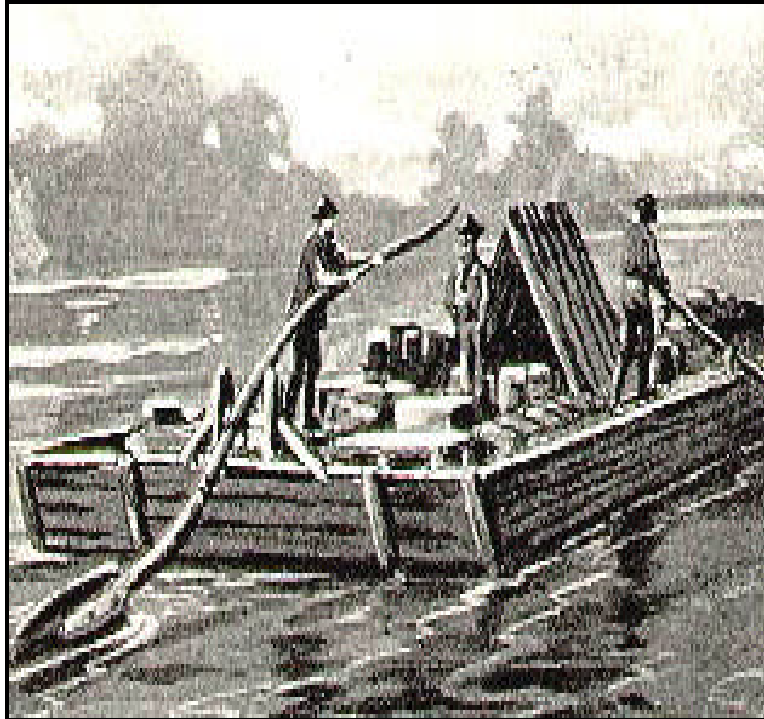
A canoe is a long, narrow boat. Canoes are pushed through the water with paddles. Indians who lived near the Ohio River made canoes out of wood and bark. Sometimes they covered a wooden frame with skins. Sometimes they covered it with tree bark. Pitch was used to make the boat watertight. This type of canoe is light and fast. It can be easily carried across land to get from one river to another. This is called a portage. In this way, Indians and later trappers could travel great distances. Today, canoes are often made of light metal or plastic.

Questions:

1. What pushes a canoe through the water? _____
2. Name two things you could use to make a canoe? _____
3. What is it called when you carry your canoe across land? _____

Student Questions:

1. _____
2. _____
3. _____



Flatboat

How to make a flatboat

auger
broad-horn
caulk
chicken

flatboat
floating
furniture
house

oakum
oar
pioneer
steer

Pioneers came down the river to Kentucky in flatboats. A family could bring furniture, tools, chickens, pigs, and even a cow or horse on the boat. Some flatboats even had a cabin with a fireplace inside. At its arrival, the boat could be taken apart. The lumber could be used to build a house.

A flatboat, sometimes called a broad-horn, was a floating box. It was hard to steer with the long steering oars. And, the boat was too bulky to take back up river. That is why flatboats became known as one-way boats.

If your family wanted to move to Kentucky from Pennsylvania 175 years ago, here's how you would first build your boat.

Cut down a poplar tree that is a hundred feet to the first limb. Hand saw the tree into boards twenty feet long, two inches thick, and twelve inches wide.

Drive a spike into each board. Use your auger to bore a two-inch hole in each end. Put a wooden pin in each hole. The pins are hard to drive in the holes. When they get wet, they will swell. Nothing will be able to pull them out.

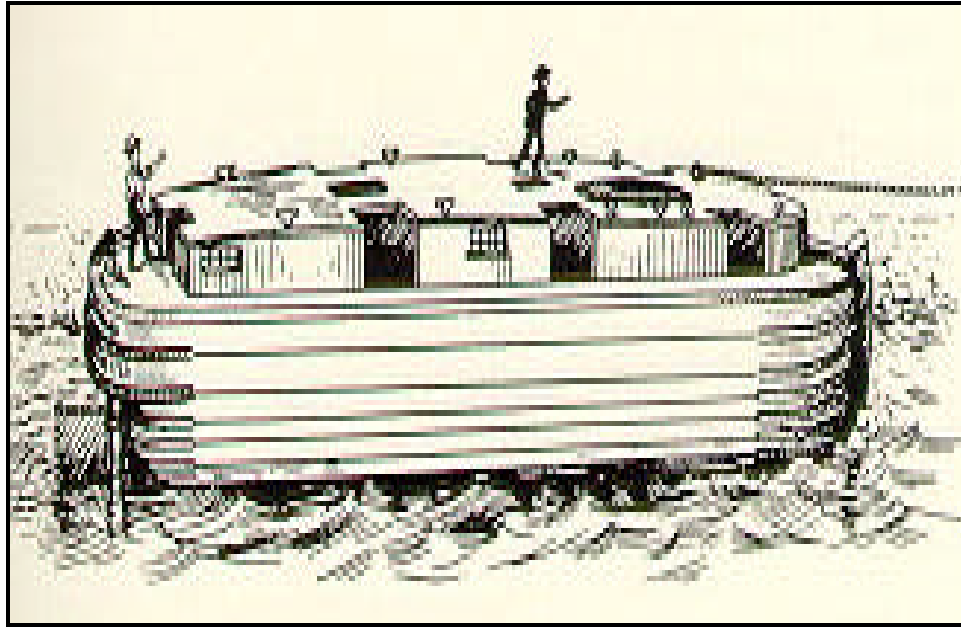
Be sure to caulk the bottom of the boat with oakum. Oakum is a natural fiber rope. Soak it in tar and stuff it in the cracks in the bottom. No water will leak into your flatboat now.

Questions:

1. Name the rope used to caulk flatboats. _____
2. What did some flatboats have in their cabins? _____
3. What is another name for flatboat? _____

Student Questions:

1. _____
2. _____
3. _____



KEELBOAT

The Keelboat

cordelle
downriver
engine
flatboat

keel
keelboat
merchant
pioneer

shoulder
slender
towpath
voyageur

Flatboats were good for pioneers coming downriver. As the country grew, more and more merchants wanted to ship goods on the river. A new type of boat was needed.

The keelboat was long and slender. It had no engine; sometimes boatmen used sails, sometimes oars, to move the keelboats up and down the river. Sometimes the workers pushed the boat, sometimes they pulled it.

When a clear towpath ran along the riverbank, keelboat workers used the cordelle— a rope nearly a thousand feet long and tied to a post in the middle of the boat. Workers, called voyageurs, pulled the boat along.

If there was no towpath, the voyageurs cut one. But, if the water was shallow, they had to use the poles. Eight voyageurs with eight poles lined up on each side of the boat. Then at the signal they all put their poles into the river bottom and pushed hard with their shoulders. As they pushed, they walked from the front of the boat to the back of the boat. In this way, they moved the boat forward. When the voyageurs pushed hard they looked as though they were crawling.

Pushing and pulling, walking and rowing, the voyageurs had a hard job getting their boats up the river. Imagine how amazed they might have been to see the first steamboat go chugging up the river.

Questions:

1. Name two ways to move a keelboat. _____
2. What is another name for a keelboat worker? _____
3. Did keelboats have engines? Yes No .

Student Questions:

1. _____
2. _____
3. _____



Steamboat

Steamboat's a'coming

amaze
ascend
compare
current

descend
engine
frightful
harness

journey
navigation
paddlewheel
steam power

The first steamboat on the Ohio was named the New Orleans. Late at night, on October 28, 1811, she arrived in Louisville. Most people at the landing that night had never seen such a sight. The roaring and hissing of the steam engine was frightful.

Harnessing steam power for riverboats was an important step in river navigation. Fire and water create steam. The force of the steam drives paddle wheel and the wheel pushes the boat through the water. Steam power allowed large boats to go up the river easily.

The New Orleans waited in Louisville several months. While waiting, the captain amazed his Louisville friends by taking them up the river against the current. On December 15th there was enough water to pass over the falls. The long wait was over.

Four years later, another steamboat amazed people at the Falls. The Enterprise landed at Shippingport just twenty-five days after leaving New Orleans, Louisiana. A keelboat needed three or four months to ascend the river. The Enterprise was the first steamboat to make the long journey up the Mississippi and Ohio Rivers to the Falls.

Now boats could go both up and down the river highway. They could ascend and descend the river. Businesses and towns grew faster and faster. Steamboats grew bigger and more beautiful. A new age– the Golden Age of Steamboats– came to the Ohio River.

Questions:

1. How long did it take a keelboat to ascend the river? _____
2. What source of power allowed boats to go up river? _____
3. What was the New Orleans waiting for at the Falls? _____
4. Name the two amazing steamboats. _____

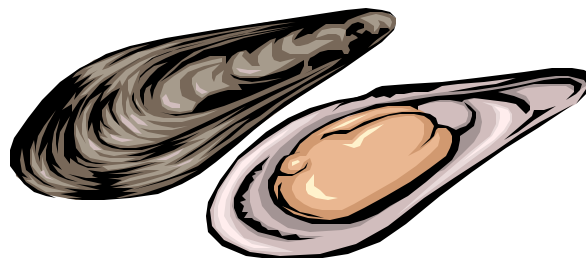
Student Questions:

1. _____
2. _____
3. _____

Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

The Ohio River Mussel Mystery

Standards	<p>Social Studies: <u>SS-E-5.2.3</u>, Students will understand that the way we live has changed over time for both Kentuckians and Americans because of changes in many areas</p> <p>Science: <u>SC-E-3.3.3</u>, Students will understand that all organisms, including humans, cause changes in the environment where they live. Some of these changes are detrimental to the organism or to other organisms; other changes are beneficial</p> <p>The following standard is introduced in this activity.</p> <p>Science <u>SC-E-1.2.2</u>, Students will understand that the position and motion of an object can be changed by pushing or pulling. The amount of change in the position or motion is related to the strength of the push or pull.</p>			
Activity Description	In this activity, students will learn about the importance of the mussel industry in Kentucky's history, as well as the invasion of the zebra mussel.			
Materials	<ul style="list-style-type: none">• Internet access (optional, but will speed up the research)• Encyclopedias• "Freshwater Mussels of the Ohio River" poster (may be obtained from KY Department of Fish & Wildlife , Phone: 502/564-448 E-mail: Wayne.Davis@mail.state.ky.us Cost: Free)			
Length of Lesson	1 class period if poster is used			
Vocabulary Words	<u>Freshwater mussel</u> —a type of bivalve shellfish (also referred to as clams, naiades, or unionids) that spend their entire adult life partially or wholly buried in mud, sand, or gravel, usually in rivers or streams.			
Essential Question	How has our relationship with water changed over time?			
Guiding Questions	How have people used Kentucky's resources in the past? How do organisms change Kentucky's environment?			
Skills Used	Research Discuss	Read Report	Write Synthesize	Communicate Interview



Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

The Ohio River Mussel Mystery, *continued*

Activity

Step 1: In preparation for this activity, contact the Kentucky Department of Fish and Wildlife Resources at 502 564-7109 to obtain a free copy of the “Freshwater Mussels of the Ohio River” poster to use as a research resource and teaching guide. Also, contact the Kentucky Folklife Program Administrator for the Kentucky Historical Society for more information on fishing for mussels (called Brailing), at 502-564-1792.

Step 2: Show students the poster, “Freshwater Mussels of the Ohio River” (or other resources showing pictures of mussels). Ask students if they have ever seen a live mussel.

Step 3: Explain to students that people in Kentucky have used mussels for thousands of years. Tell students that long ago Archaic Indians used freshwater mussels in Kentucky for food and ornaments. Mussels were also harvested, beginning in the 1890's, to make buttons, then in the 1950's to provide the shell implant to use for producing cultured pearls.

Step 4: Divide students into small groups of 3 or 4 and provide each group with Internet access. (Web sites containing background information about freshwater mussels can be found by accessing www.google.com/ and typing in “freshwater mussels”.) Give each group one of the following questions to answer. Students should list their own questions as well on question strips.

- What good are freshwater mussels?
- Do people eat freshwater mussels and what do freshwater mussels eat?
- Are freshwater mussels in trouble? Why?
- What can people do to help save freshwater mussels?
- What is a zebra mussel and how was it introduced into the Ohio River ecosystem?
- How is the zebra mussel affecting the freshwater mussel population in the Ohio River?

Step 5: Once the research has been completed and each group has answered the assigned question, bring the entire class back together to share their answers and any new questions or information.

Step 6: Take the gathered information and, as a class, design a PowerPoint presentation about freshwater mussels to share with a local river conservation group, at a parents' night or at a local community event. Ask each group of students to be responsible for designing at least one slide for the PowerPoint presentation that shares the information they had to research. Some students may be assigned the task of including slides showing a history of the freshwater mussel industry in Kentucky, also.

Step 7: Conclude this activity by reminding students that this is another example of how the activities of living things are all closely interconnected. Discuss extinction and endangered and threatened species.

Extensions

1. Locate on a map how the zebra mussels traveled from China, to the Great Lakes (where they were released from the ballast of cargo ships into the Great Lakes), then on to Kentucky.
2. Talk about competitions for niches in an ecosystem. What other animals have become extinct, or are on the endangered species list, because of the actions of other organisms in their ecosystems?
3. Look for “pearl” buttons or other items that are made from mussels.
4. Draw a poster of the food chain showing where freshwater mussels fit into the picture.

Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

The Mystery Surrounding Kentucky's Dams

Standards	<p>Science: SC-E-3.3.3, Students will understand that all organisms, including humans, cause changes in the environment where they live. Some of these changes are detrimental to the organism or to other organisms; other changes are beneficial (e.g., dams build by beavers benefit some aquatic organisms but are detrimental to others).</p> <p>Social Studies: SS-E-4.1.5, Students will understand that different factors in one location can have an impact on another location (e.g., natural disasters, damming a river).</p> <p>Social Studies: SS-E-5.2.3, Students will understand that the way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, recreation, traditions, education).</p>			
Activity Description	This activity involves students conducting research to find out about the history of a nearby dam and how it changed life in the area.			
Materials	<ul style="list-style-type: none">• Internet access (optional, but will speed up the research)• Encyclopedias and maps showing Kentucky 100 years ago and now• Interview questions			
Length of Lesson	Length of lesson depends upon how long it takes to complete research			
Vocabulary Words	<p><u>United States Army Corps of Engineers</u>— military and civilian engineers, scientists and other specialists who work on engineering and environmental matters to meet the demands of changing times and requirements as a part of America's Army.</p> <p><u>Tennessee Valley Authority (TVA)</u>—began as a result of the TVA Act, in 1933, to monitor and protect natural resources in the Tennessee River Valley, by building dams for flood prevention and hydropower.</p> <p><u>Lock</u>—a part of a canal with gates at each end where boats are raised or lowered to different water levels.</p>			
Essential Question	<ul style="list-style-type: none">• How has our relationship with water changed over time?			
Guiding Questions	<ul style="list-style-type: none">• How are the actions of humans within a watershed interrelated with other living things?			
Skills Used	Research Discuss	Read Report	Write Synthesize	Communicate Interview



Protecting Kentucky's Water – Be a Water Historian Intermediate

The Mystery Surrounding Kentucky's Dams, *continued*

Activity: Part 1

NOTE: There are some strong issues concerning the renovation or destruction of deteriorating dams in the state of Kentucky. This is not the focus of this activity. Caution should be used when allowing students access to the Internet to do research because several web sites do contain some controversial articles about dams that might worry students in the intermediate grades. This activity is centered around humans' influence on the environment and change over time.

Step 1: Ask students if they have ever seen a dam. Call on student volunteers (if there are any) to tell where the dam was that they saw and describe what it looked like for the rest of the class.

Step 2: Ask students to think about and discuss why they think dams have been built.

Step 3: Explain to students that Kentucky's topography has changed over the past century because of the construction of dams across the state. (As of April, 2002, according to the National Dam Safety Review Board State Evaluation Criteria reports, there were 943 dams in the state of Kentucky. Many of these dams are privately owned, but still must meet state regulations for safety.)

Step 4: Tell students that they will get to do more detective work during this activity. Explain that they will be choosing a dam in Kentucky about which they would like to learn more. (If you would prefer to have students research dams within the local watershed, that is fine.) Explain that it will be their job to find out the following things about the dam they choose to investigate:

- Why and when was the dam built?
- Were people moved to build it? Approximately how many?
- Were habitats lost and/or created by the dam?
- Students should also come up with their own questions.

Step 5: Arrange for students to visit the media center, or use classroom computers, to research dams in the state. Offer assistance, where needed, in finding a contact person, if answers are not found in other research tools.

Step 6: Have students share information with class after research has been completed.

NOTE: Information about the Army Corps of Engineer dams may be located at the following web site: <http://www.lrl.usace.army.mil/ld98/more.htm>. From this site, the Army Corps of Engineers District web sites in Louisville and Nashville can be viewed, and information about who to contact are available. By following the link to "Dam Safety", pictures of dams across the state may be viewed on the web site by clicking the dam on a map. There is a brief history and the name of a contact person on the web site.

Also, information about TVA dams may be accessed from the following web site: http://www.tva.gov/sites/sites_ie.htm

Step 7: If your school is close to one of the larger dams, you may wish to have students interview older residents who might be able to share some stories with the class about life in the area before and after the dam was built. Such a visit would make a wonderful social studies lesson about change over time and the results of human influence.

If there are privately owned dams in the area, you may wish to have some students contact and interview the property owner.

Extension

Investigate how the lock and dam system works and why this system is so important on some of Kentucky's rivers. Build models of a lock and dam system using the stream tables or watershed models created in earlier activities.



An 1895 map of Kentucky can be downloaded from <http://www.livgenmi.com/ky1895mp.htm>
 For individual county maps, go to <http://www.livgenmi.com/1895ky>
 Map may be enlarged, or a transparency made, for student viewing.

Extension



To investigate a dam during the building process, visit the following web site with students: <http://www.nationalgeographic.com/geoguide/dams/index.html>

Click on the “before” button to view the area before the dam is started. Then progress to the “during” button to see the water being piped into the reservoir area. Finally, click the “after” button to see the resulting reservoir. This site also presents advantages and disadvantages of damming rivers.



Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

Capturing a Moment in Time: A Culminating Activity

Standards

Social Studies: SS-E-5.1.2, Students will understand that history can be understood by using a variety of primary and secondary sources and tools (e.g., artifacts, diaries, time lines).

Writing: WR-E-1.4, Students will write an informative and persuasive piece for an authentic audience to accomplish realistic purposes.

Activity Description

Using photographs, interviews, surveys, stories, etc. collected throughout this unit of study about water, students will create a time capsule containing a biography of how water is used in their county to present to the local historical society, or school, to be kept safe for a specified number of years.

Materials

- Collections of stories, photographs, interviews, survey results, etc.
- Container to use for time capsule

Length of Lesson

Length will vary depending upon the amount of material that has been collected throughout this unit of study

Essential Question

How has our relationship with water changed over time?

Guiding Questions

- How has water been used in my community?
- How can we preserve information for future generations to view?

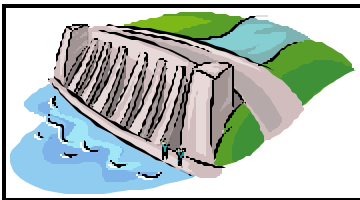
Skills Used

Research
Discuss

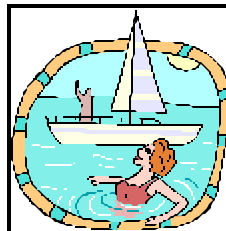
Read
Synthesize

Write
Organize

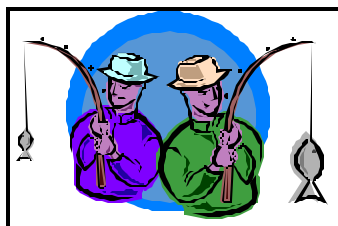
Communicate
Create



Dams/Hydroelectricity



Boating and Swimming



Fishing

Farming/Gardening



Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

Capturing a Moment in Time, *continued*

Activity

Step 1: As a culminating activity to the study of Kentucky's water, ask students to help sort interviews, stories, photographs, survey results, etc. that have been written and collected throughout the preceding activities.

Step 2: Tell students that they have investigated many different water topics and, hopefully, they have learned a lot about Kentucky's past and present dependency on water. Explain that they now have the opportunity to leave a legacy for future Kentuckians to view and study showing how water is currently being used in the local environment. Explain that they will prepare a time capsule to send to the local historical society, or place in a special area of school, to leave for students to open in 50 years.

Step 3: After examining all of the current information on local water usage that has been collected over the past weeks (using water droplets), ask students what other types of information they feel should be included, that may still need to be gathered. Make a list of suggestions, and narrow the list down. Assign different students the task of collecting the items suggested, if necessary.

Step 4: Once the photos, articles, brochures, etc. have been collected and organized, as a class peruse the material very closely. Explain to students that they must now narrow down the final items that will fit in the time capsule. (Show students the time capsule that will be used. Keep the time capsule small so students will have to be more selective when choosing the most important items to be placed in it.)



Step 5: Encourage students to offer suggestions and opinions about the most important artifacts that should be included in the time capsule through persuasive writings. Explain that each item suggested for inclusion in the time capsule should be defended with specific reasons why it would make an impact on future Kentuckians, and be of historical value.

NOTE: This writing activity would make a wonderful assessment, as it should show some higher level thought process as to what each student feels is a very important historical record of the way water is currently being used locally. (See Rubric.)

Step 6: Once the persuasive writings are completed, decide on a panel of impartial judges to make the final selections, based on the supportive arguments from the student writings.

Step 7: When the collection of artifacts to be placed in the time capsule have finally been selected, show them to the students, seal them in the time capsule, and deliver the time capsule to the place where it will rest until future Kentuckians decide to investigate the importance of water in their lives! Make a ceremony of this. Take digital photographs and have students mail them to the local media.

Step 8: Have students brainstorm a way to insure the time capsule is found and read by a class fifty years from now.

Extension

Assign students to write a news article for the local newspaper or television stations, telling about the class time capsule project.

	Assessment Rubric for “Capturing a Moment in Time”
Level Four	Student is able to describe at least four ways Kentuckians have used water in the past, how those particular uses of water have or have not changed, and how each use has affected the environment and the lives of the people living then and now.
Level 3	Student is able to describe at least three ways Kentuckians have used water in the past, how those particular uses of water have or have not changed and how at least one of those uses has affected the environment and the lives of people living then and now.
Level Two	Student is able to describe at least three ways Kentuckians have used water in the past and how at least one of those uses has affected the environment and the people who lived then.
Level One	Student is able to describe at least two ways Kentuckians have used water in the past.



Kentucky's Commonwealth of Water – Be a Water Historian Intermediate

Investigating The History of Water Through Music

(An Enrichment Activity)

Standards

Arts and Humanities: AH-E-3.1.41, Students will create and perform using creative dramatics improvisation, mimicry, pantomime, role playing, and storytelling).

Social Studies: SS-E-2.1.1, Students will understand that language, music, art, dress, food, stories, and folk tales help define culture and may be shared among various groups.

Activity Description

After creating a timeline of historical events surrounding water in the local county and/or state, the music teacher will help students compile and perform a collection of songs and stories about the history of how water has been used (and abused).

Materials

- Collections of folk songs and other music about water
- Internet access for environmental history timeline

Length of Lesson

Length will vary according to how long it takes to prepare timeline and how long it takes to collect, learn and perform water songs.

Essential Question

How has our relationship with water changed over time?

Guiding Questions

- What are some important water historical events in our area or state?
- Who can help us collect water songs?

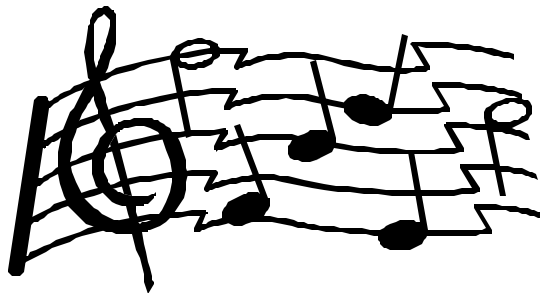
Skills Used

Research
Discuss

Read
Sing

Write
Perform

Communicate
Create



Protecting Kentucky's Water – Be a Water Historian Intermediate

Investigating the History of Water Through Music *continued*

Activity

Step 1: Before introducing this activity to students, talk to the music teacher, or a parent with a musical background, about working with students to collect songs about water — especially water in Kentucky.

Step 2: Explain to students that over the years, music has been used as a way to record people's feelings, thoughts, and historical events. Tell students that they will have the opportunity to help prepare, and perform, a collection of musical pieces about water, but that they must first develop a timeline showing historical water events that have happened locally, or at the state level.

Step 3: Decide as a class how far back in time you would like the students to research to come up with a history of water. Then, divide students up into small groups to research specific years for significant dates.

Step 4: To make the timeline research move more quickly, visit the following web site: <http://www.kyeqc.net/thirty/time/maintime.htm> and download information for students to refer to when creating their portion of the timeline.

Step 5: Ask students to check with parents at

home to see if they remember learning any songs when they were younger about water, or about historical events in Kentucky that were related to water. Instruct students to bring any ideas from parents to school with them.

Step 6: Work with students, a music teacher, or a parent volunteer, to search the Internet, musical tapes and CDs and music books looking for samples of songs that can be sequenced in such a way to tell a history of our relationship to water in Kentucky. For example, "There's a Hole in the Bucket, Dear Liza" can be used to show how people used to carry water. Or students can write songs to familiar musical tunes or to their own tunes. Also, begin working on short speaking parts for students to say that can be used to introduce each song during the performance.

Step 7: Once the songs have been collected, written, organized, and learned, schedule a performance date and time to share the musical with both the school and family communities, as you celebrate the history of water through music!

Water Songs

1. Cockles and Mussels
2. Crawdad
3. Hole in the Bucket
4. Down by the Old Mill Stream
5. Down by the Riverside
6. Have You Ever Gone A-Fishing
7. Michael Row the Boat Ashore
8. Row, Row, Row Your Boat
9. The Water is Wild
10. Shenandoah



Assessment

We have been working on developing a timeline of the history of water in our area and trying to find music to help us tell that history in song.

Thinking about the different songs you have learned about water, which song do you think best describes a true historical event in our local history? Give examples.

Protecting Kentucky's Water – Be a Water Historian Intermediate

Investigating the History of Water Through Music *continued*

Cockles and Mussels

In Dublin's fair city where girls are so pretty
I first set my eyes on sweet Molly Malone,
As she wheeled her wheelbarrow
Through streets broad and narrow

Refrain

Crying cockles and mussels
Alive, alive oh!
Alive, alive oh! Alive, alive oh!
Crying cockles and mussels
Alive, alive oh!

She was a fishmonger, but sure 'twas no wonder
For so were her father and mother before her,
And they each wheeled their barrow
Through streets broad and narrow

Refrain

She died of a fever, and no one could save her,
And that was the end of sweet Molly Malone,
Now her ghost wheels her barrow
Through streets broad and narrow

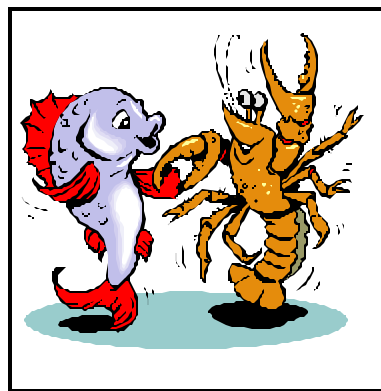
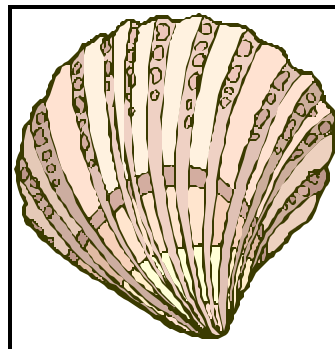
Refrain

Crawdad

Chorus

You get a line and I'll get a pole, honey,
You get a line and I'll get a pole, honey
You get a line and I'll get a pole
And we'll all go down to the crawdad hole,
Honey, sugar - baby mine.

Get up old man, you slept too late, honey,
Get up old man, you slept too late, baby,
Last piece of crawdad's on your plate,
Honey, sugar— baby mine.



Protecting Kentucky's Water – Be a Water Historian Intermediate

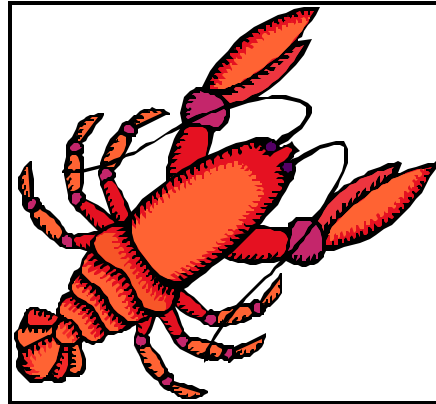
Investigating the History of Water Through Music *continued*

Get up old woman, you slept too late, honey,
Get up old woman, you slept too late, baby,
Crawdad man done past your gate,
Honey, sugar-baby mine.

Along come a man with a sack on his back, honey,
Along come a man with a sack on his back, baby,
Packin' all the crawdad he can pack,
Honey, sugar-baby mine.

What you gonna do when the lake goes dry, honey,
What you gonna do when the lake goes dry, baby,
Sit on the bank until I cry,
Honey, sugar-baby mine.

I heard the duck say to drake, honey,
I heard the duck say to the drake, baby,
There ain't no crawdads on this lake,
Honey, sugar-baby mine



Hole in the Bucket

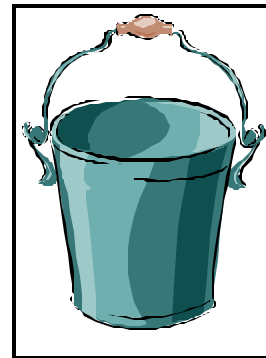
(Sing in two parts if possible -Henry and Liza)

Henry: There's a hole in the bucket,
Dear Liza, dear Liza,
There's a hole in the bucket,
Dear Liza, a hole.

Liza: Then fix it, dear Henry,
dear Henry, dear Henry.
Then fix it, dear Henry,
dear Henry, fix it.

Henry: With what shall I fix it,
dear Liza, dear Liza,
With what shall I fix it,
dear Liza, with what?

Liza: With a straw, then, dear Henry,
dear Henry, dear Henry,
With a straw, then, dear Henry,
Dear Henry, a straw.



Henry: If the straw be too long,
dear Liza, dear Liza...

Liza: Then cut it, dear Henry

Henry: With what shall I cut it?

Liza: With a knife...

Henry: If the knife be too dull?

Liza: Whet the knife...

Henry: With what shall I whet it?

Liza: With a stone...

Henry: If the stone be too rough?

Liza: Then, smooth the stone...

Henry: With what shall I smooth it?

Liza: With water...

Henry: With what shall I fetch it?

Liza: In a bucket...

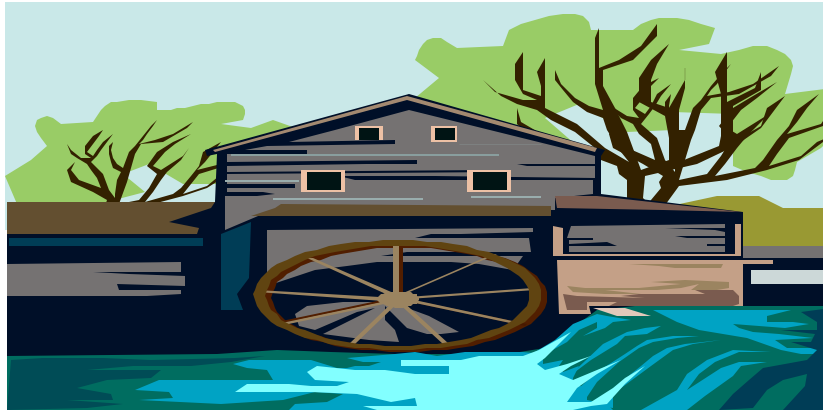
Henry: But, there's a hole in the bucket...

Protecting Kentucky's Water – Be a Water Historian Intermediate

Investigating the History of Water Through Music *continued*

Down by the Old Mill Stream

Down by the old (not the new but the old) Mill Stream (not the river but the stream)
Where I first (not last but first) Met you (not me but you)
With your eyes (not your nose but your eyes) So blue (not green but blue)
Dressed in gingham (not in satin but gingham) Too (not one but two)
For it was then (not now but then) I knew (not old but new)
That you loved (not hated but loved) Me true (not false but true)
You were sixteen (not seventeen but sixteen) My village queen (not the king but the queen)
Down by the old (not the new but the old) mill stream (not the river but the stream)



Down by the Riverside

Gonna lay down my burden,
Down by the riverside,
Down by the riverside,
Down by the riverside,
Gonna lay down my burden,
Down by the riverside,
Down by the riverside.

Ain't gonna study war no more,
Ain't gonna study war no more,
I ain't gonna study war no more,
Ain't gonna more.

Gonna put on my long white robe...
Gonna lay down my sword and shield...
Gonna ride in the golden chariot...
Gonna try on my silver crown...
Gonna climb the road to Heaven...

I'll fight the wicked devil...
Gonna cross the river of Jordan...
Gonna read the Holy Bible...
Gonna meet my blessed Jesus...



Protecting Kentucky's Water – Be a Water Historian Intermediate

Investigating the History of Water Through Music *continued*

Have You Ever Gone A-Fishing

(To the tune of Turkey in the Straw)

Have you ever gone a fishing (casting motions)
On a sunny, sunny day (make a circle with arms over heart)
With all the little fishies
Swimming in the bay? (swimming motions)
With their hands in their pockets, (hands in pockets)
And their pockets in their pants (hands on back pockets)
And all the little fishies
Do a hoochey-koochey dance! (dance like nobodies watching!)



(First two lines, wave arms above head and turn around; then gestures as above)

Tra-la-la-la, la-la-la-la-(2x)

With their hands in their pockets,
And their pockets in their pants,
And all the little fishies
Do a hoochey-koochey dance!

Michael Row the Boat Ashore

Michael, row the boat ashore, Alleluia
Michael, row the boat ashore, Alleluia
Sister, help to trim the sail
Sister, help to trim the sail
Brother, lend a helping hand
Brother, lend a helping hand
Jordan's river is deep and wide
Milk and honey on the other side



Row, Row, Row Your Boat

(Sing in rounds)

Row, row, row your boat
Gently down the stream
Merrily, merrily, merrily, merrily
Life is but a dream.



Protecting Kentucky's Water – Be a Water Historian Intermediate

Investigating the History of Water Through Music *continued*

The Water is Wide

The water is wide; I can't cross o'er,
And neither have I wings to fly.
Give me a boat that can carry two,
And both shall row, my love and I.

2. A ship there is, she sails the sea,
She's loaded deep, as deep can be.
But not so deep as the love I'm in;
I know not how I sink or swim.

3. I leaned my back against an oak,
Knowing it was a trusty tree.
At first it bent, but never broke;
Thus did my love prove true to me.

4. O, love is handsome, love is fine,
Gay as a jewel when first it's new;
And love grows old, and ever bold,
And shines as bright as morning dew.

SHENANDOAH

O Shenandoah ! I long to hear you,
Way-aye, you rolling river
Across that wide and rolling river.
Away, we're bound away
'cross the wide Missouri !

O Shenandoah, I love your daughter
Way-aye, you rolling river
I'll take her 'cross yon rolling water
Away, we're bound away
'cross the wide Missouri !

For seven years I courted Sally,
Way-aye, you rolling river
For seven more I longed to have her
Away, we're bound away
'cross the wide Missouri !

She said she would not be my lover
Way-aye, you rolling river
Because I was a tarry sailor
Away, we're bound away
'cross the wide Missouri !

At last there came a Yankee skipper
Way-aye, you rolling river
He winked his eye, and tipped his flipper
Away, we're bound away
'cross the wide Missouri !



Water Reading List for Intermediate Grades*

1. ***Bear Loves Water.*** (Preschool) By Ellen Weiss. Bear teaches readers about water in all its forms - puddles, bubbles, snowflakes and clouds.
2. ***Brother Eagle, Sister Sky: A Message from Chief Seattle.*** (4-8 years) Illustrated by Susan Jeffers. A story about Native American beliefs and how each generation deserves to breathe fresh air, drink pure water and to enjoy all the beauty that the earth offers.
3. ***Common Ground: The Water, Earth, and Air We Share.*** By Molly Garrett Bang. Explains how everyone in the world depends on each of us individually to protect resources and maintain respect for the environment.
4. ***The Drop in My Drink.*** (9-12 years) By Meredith Hooper and Chris Coady. Water takes on fascinating new significance as readers discover the amazing complexity of a substance we take for granted. Includes a detailed depiction of water cycles, amazing facts and important environmental information.
5. ***A Drop Of Water: A Book of Science and Wonder.*** By Walter Wick. Shows the different forms of water in amazingly detailed photographs; explains water's properties.
6. ***The Earth and I.*** (4-8 years) By Frank Asch. Explains the friendship between the earth and a young child and what each can do for the other.
7. ***Follow the Water from the Brook to the Ocean.*** By Arthur Dorrons. Explains how water flows from brooks, to streams, to rivers, over waterfalls, through canyons and dams to eventually reach the ocean.
8. ***The Four Elements: Water.*** (Preschool) By Carme Solé Vendrell and J.M. Parramón. Text and illustrations explain the properties of water and its uses. Includes a special section to help adults answer children's questions.
9. ***Gullywasher.*** (4-8 years) By Joyce Rossi. In English and Spanish. A grandfather tells tall tales of his life as a cowboy (vaquero) and of the harsh life in the desert, flash floods, and wildlife.
10. ***I Am Water*** (4-8 years) By Jean Marzollo. A first book about water in its different forms and uses.
11. ***Magic School Bus: At the Waterworks.*** By Joanna Cole. Mrs. Frizzle, the science teacher, drives the magical school bus into a cloud where the children shrink to the size of water droplets and follow the course of the water through the city's waterworks system.

* Please note that not all books on this list are included in the PRIDE list approved for purchase. See <http://www.kypride.org/> for that list.

Water Reading List for Elementary School (cont.)

12. ***Magic School Bus: Se Salpica Toda.*** (4-8 years) By Joanna Cole. In Spanish, experience the earth's water cycle first hand as Mrs. Frizzle's class rises into the air, forms a rain cloud, a drizzles down to earth just like rain.
13. ***Magic School Bus: Wet All Over.*** (4-8 years) By Joanna Cole. Experience the earth's water cycle first hand as Mrs. Frizzle's class rises into the air, forms a rain cloud, a drizzles down to earth just like rain.
14. ***One Small Square: Cactus Desert.*** (6-10 years) By Donald M. Silver. Teaches about all the plants and wildlife that exist in one small square of desert - an excellent introduction to ecosystems and biodiversity.
15. ***River Ran Wild: An Environmental History.*** By Lynne Cherry. A history of New Hampshire's Nashua River starting 7,000 years ago until its recent reclamation. This is a good explanation of what can happen over time to a body of water and its wildlife -- what people can do to the environment and what they can do for it.
16. ***Snail Girl Brings Water.*** (6-10 years) By Geri Reams. A retelling of a traditional Navaho creation myth which explains how water came to earth.
17. ***Splish, Splash, Splosh.*** (4-8 years) By Mick Manning and Brita Granström. Join the adventures of a young boy and his dog and ride the waves, float on rain-filled clouds, shoot down fast-flowing rivers, and splash through sewers until you get where all water ends...and begins.
18. ***This Place is Dry.*** By Vicki Cobb, Barbara Lavalley (Illustrator). Surveys the living conditions in Arizona's Sonoran Desert for the people and the unusual animals that live there. Also describes the engineering accomplishment of the Hoover Dam.
19. ***Water.*** By Frank Asch. Aimed at very young children, this book artfully describes water in it many forms, its uses, and its role in our lives.
20. ***Water (My First Nature Book).*** By Andrienne Soutter-Perrot, Etienne Delessert (Illustrator). Explains water in its different form and why every living thing needs water.
21. ***Water Science, Water Fun: Great Things to Do with H₂O.*** (9-12 years) By Noel Fiarotta and Phyllis Fiarotta. Lessons and experiments teach about floating, refraction, leaching temperature gravity, buoyancy, flow and other water properties.
22. ***Water, Water Everywhere (Discovery Readers).*** By Melvin Berger, Gilda Berger, Bobbi Tull (Illustrator). A book about the water cycle, treatment, distribution, and wastewater treatment.
23. ***Where Do Puddles Go?*** (4-8 years) By Fay Robinson. An early book to explain water cycles and water in all its forms.
24. ***Where Does Water Come From?*** (6-10 years) By C. Vance Cast. Clever Clavin shows how much water there is on earth, how wells are dug to bring it out of the ground, and how water treatment plants work.
25. ***The Woman Who Outshone the Sun/La Mujer Que Brillaba Aún Más Que el Sol.*** By Alejandro Cruz Martinez, Fernando Olivera (Illustrator). A bilingual tale from ancient Mexico that tells of a beautiful woman who arrives in a mountain village and is driven out because she is different, taking the river with her.